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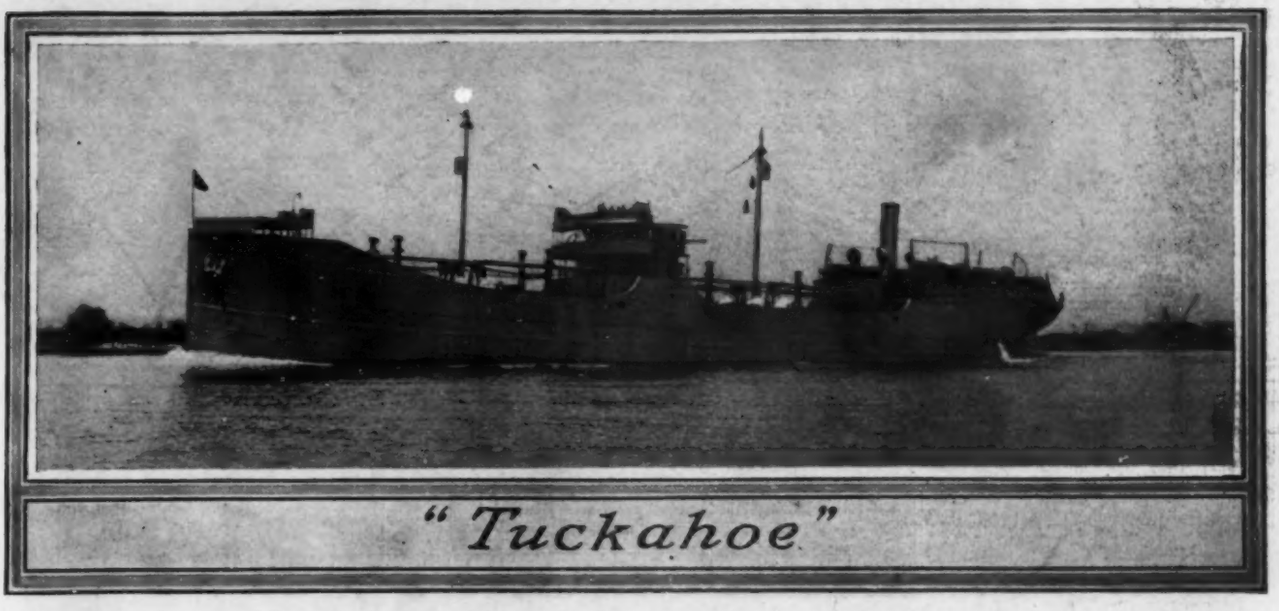


"Tuckahoe"

The Building of the Tuckahoe

By E. A. Suverkrop

The cry has been for ships and more ships, but it has taken time for shipbuilders to get ready for rapid production. Evidence that ships are now being turned out in record time is given in this article, which tells of the building and launching of the steam collier "Tuckahoe," 5500 tons, in 27 days after the laying of her keel.

THERE has been much adverse criticism of the progress made in building ships to offset the losses occasioned by submarines. Much of this criticism has come from papers that are as ignorant of shipbuilding as most of their readers. It is possible that they were honest, but they should have qualified as experts before they published their reports. There have been delays and wasted efforts due to a thousand-and-one causes, among which transportation difficulties and lack of material are important factors, but the calamity howlers have printed little about the magnificent results that have been attained.

There are over 150 shipyards in operation and more in contemplation. Not a year ago Hog Island was a combination desert and swamp; today 25,000 men are employed there, and to a lesser degree other yards can show a substantial transformation.

In the older yards ships that formerly took from three to six months to build are now turned out in less than half that time. Hardly a day passes but one hears of some record in one of the branches of ship construction being broken and on the following day that it has again been smashed.

As the New York Shipbuilding Corporation, Camden, N. J., is at this writing in the public eye because of the record-breaking building of the *Tuckahoe*, it might be of interest to summarize briefly the resources of the plant and then to give a short analysis of the building of this ship, data for both of which have been supplied to me by that company.

The plant covers an area of approximately 160 acres and employs 10,000 men who work in shifts, two or three, according to the nature of the work.

With the exception of the foundry work and the rolling of ship plates all material is fabricated in the yard.

There are 12 main shops, where all wood and metal work is handled. These include engine-building, machine, forge, coppersmithing, plate, mold, plumbing, boiler-shops, etc.

There are 24 ways for ships, 14 of which are for large ships and the remaining 10 for destroyers.

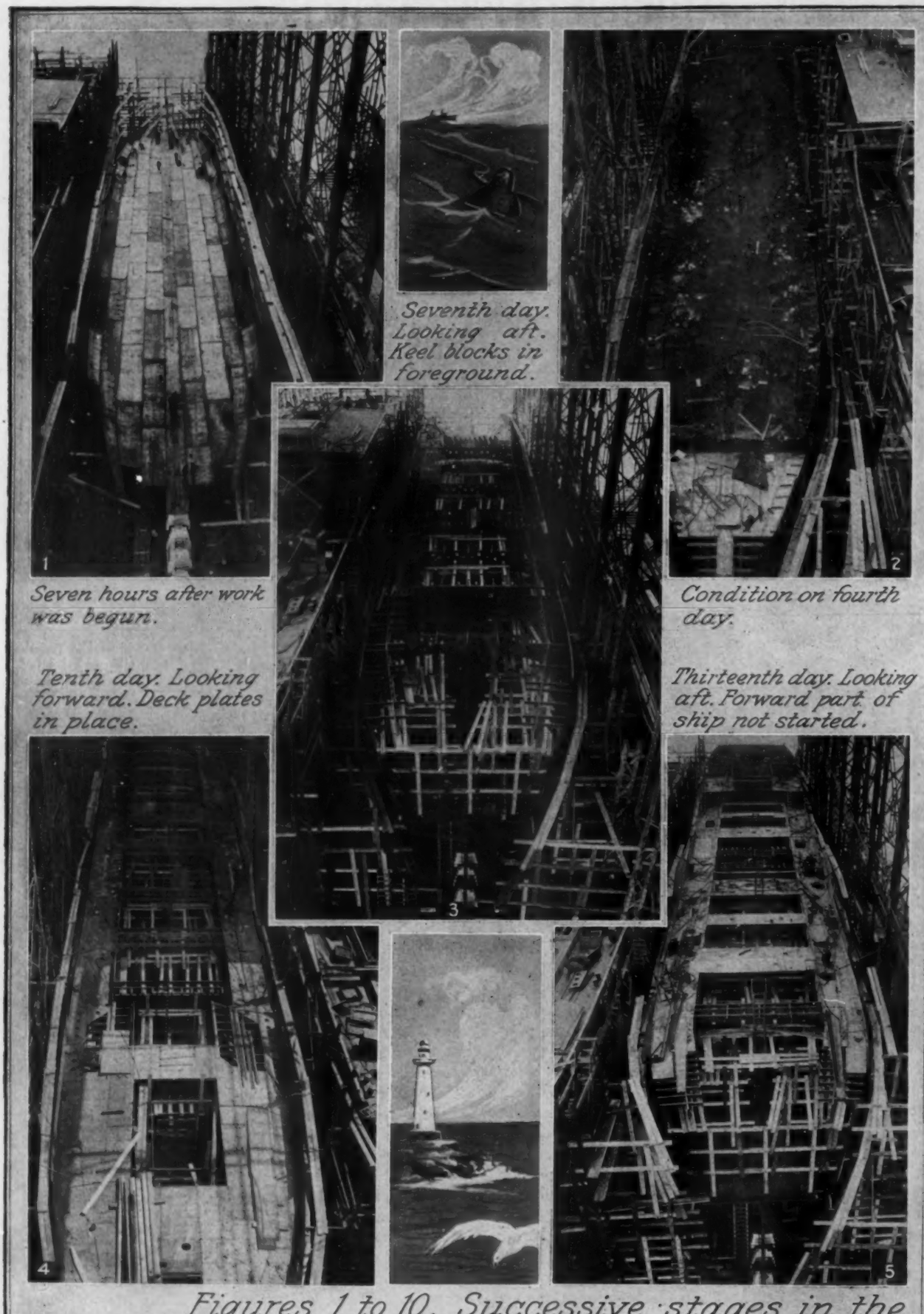
There are five wharves and one wet slip where ships are moored after launching so that they can be outfitted. The wet slip is served by a 100-ton overhead crane for fitting-out purposes, and the wharves by a 35-ton traveling gantry crane and two 40-ton locomotive cranes.

There are about ten miles of trackage throughout the yard connecting with spur tracks from the Philadelphia & Reading Railway and Pennsylvania Railroad.

The capacity of the storage warehouses is roughly two million cubic feet.

Electric, air and hydraulic power systems are supplied by power plants in the yard.

A locker and lunch room building is under construction, which during the lunch hour will be able to serve 2000 men every 20 minutes. There are also under construction 1107 houses for employees, the first of which will shortly be ready for occupancy.


Seven hours after work was begun.
Seventh day. Looking aft. Keel blocks in foreground.
Condition on fourth day.
Tenth day. Looking forward. Deck plates in place.
Thirteenth day. Looking aft. Forward part of ship not started.
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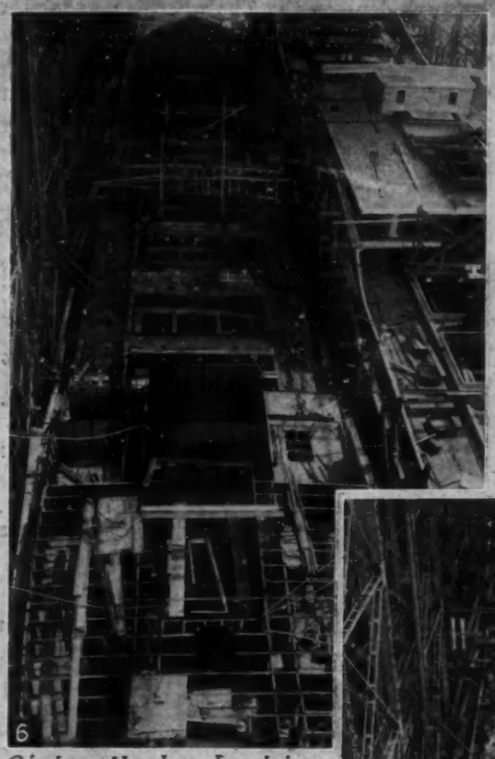
2
3
4
5

Figures 1 to 10. Successive stages in the



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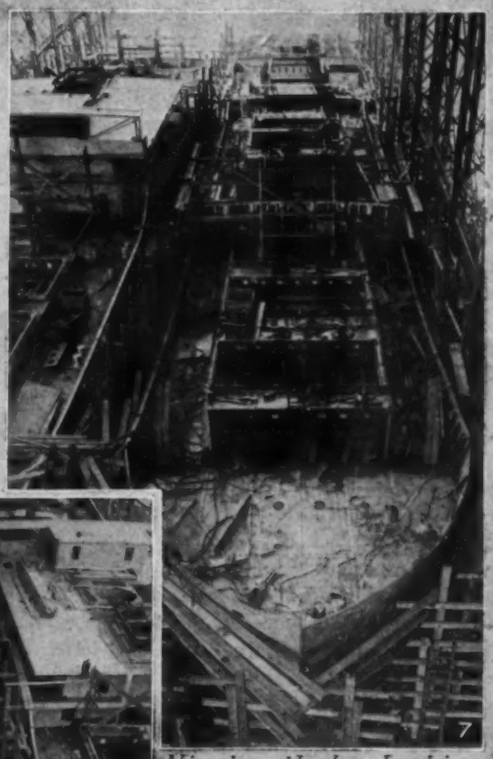
Sixteenth day. Looking forward. Bow and forecastle well under way.

Twenty-second day. Looking forward. Upper deck and deck beams.



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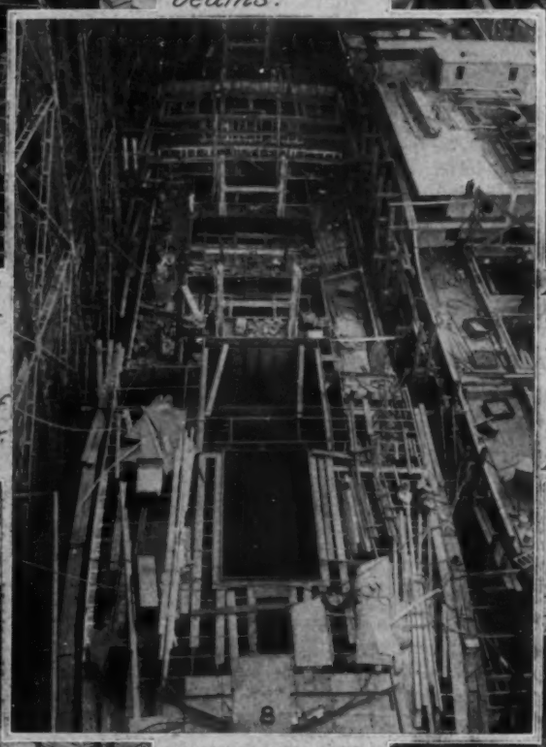
Nineteenth day. Looking aft. Bow and forecastle in foreground.



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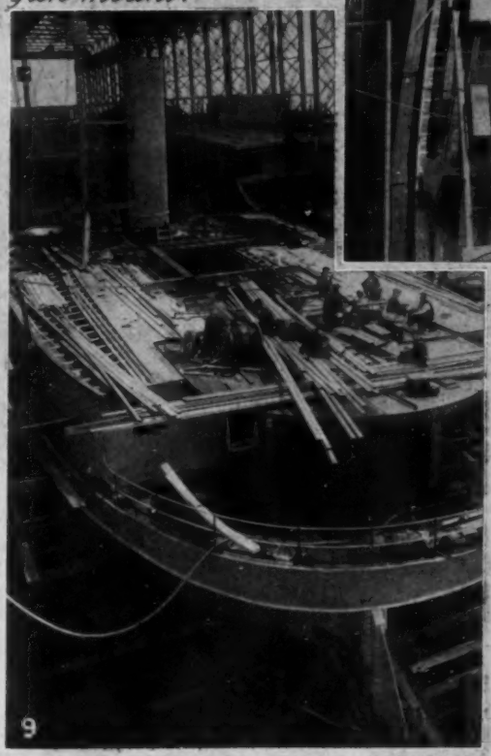
Twenty-sixth day. View of stern and semicircular gun mount.

Twenty-seventh day Ready for launching.



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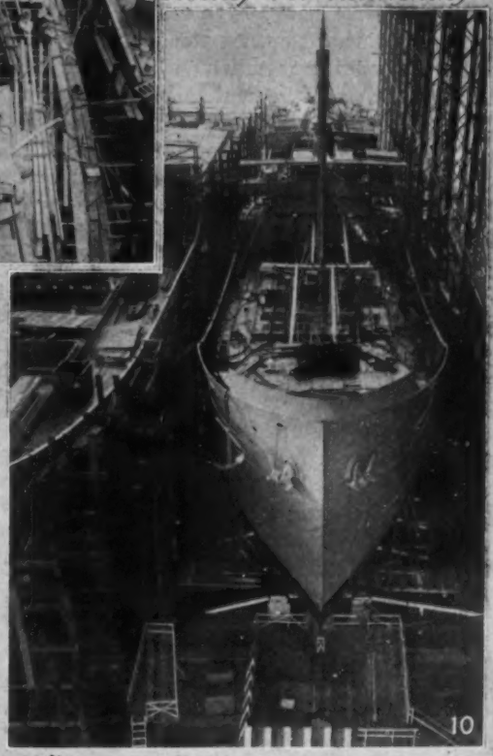

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building of the U. S. Steam Collier "Tuckahoe"

Photos by N.Y. Shipbuilding Co.

An industrial-service department takes care of all welfare work. The emergency hospital, where first aid is administered, has two doctors and two first-aid men in attendance. There is an ambulance in which serious cases are transported to the hospital.

This yard, if not the first, was among the first in this country to have covered ways so that weather conditions do not delay the progress of the work. This is a matter of considerable importance, for I can remember when working in an uncovered yard being laid off on many occasions for periods of from a few hours to several days because of inclement weather.

All the world's records for rapid shipbuilding were broken at this yard on the afternoon of May 5 when the 5500-ton collier *Tuckahoe* was launched just 27 days after work was begun on her. At the time of her launching the *Tuckahoe* was more nearly completed than any other ocean-going steamship had ever been at the time of launching. When she took the water her boilers and engines were installed, her stack, masts and loading booms were in place and the gun mounts forward and aft were completed. It may be also mentioned that 10 days after launching she took on a cargo of coal at one Atlantic port and delivered it at another.

She is a single-screw steel collier of 5488 deadweight tons capacity. Her length over all is 332 ft. 6 in.; beam, 49 ft. 3 in., and depth, 29 ft. 6 in. She was built to conform to Lloyd's requirements and her equipment and outfit are according to the requirements of the Board of Supervising Inspectors of Steam Vessels.

Handling of Material Greatly Hampered

Owing to her position between two other ships that were under construction, the handling of material for the *Tuckahoe* was greatly hampered and she could be served by only a single 15-ton crane. Under usual conditions two overhead cranes would have been available. For this reason the men who worked on her will not admit that their achievement in building her in 27 days is the limit of their capacity. The speed with which they worked was due to superior organization, to the fact that material came in a fairly steady stream and that the gangs of workmen were thoroughly capable of taking care of it when it did come. Much has appeared in the daily press recently relative to the enormous numbers of rivets that have been driven in a specified number of hours by gangs of workmen. That the mere driving of a large number of rivets in a specified time does not really mean rapid production of ships is proved by the fact that while as high as 2276 rivets a day have been driven by a gang at the New York Shipbuilding Corporation's yard no such number was driven by any gang employed in building the *Tuckahoe*, the largest day's work of a gang of rivet drivers on the *Tuckahoe* being 1300 a day.

A notable feature relative to the building of this ship is that not a single workman was injured throughout the entire course of construction. Through the courtesy of the New York Shipbuilding Corporation I am able to illustrate the gradual construction of the *Tuckahoe*. The reproductions are from regular progress photographs taken daily by the yard photographer of each ship being built. Selection was however made of prints from plates taken at intervals of three days throughout the course of construction.

The subjoined table gives a condensed daily progress report of the work done on the *Tuckahoe* from the start until she was ready to be launched.

CONDENSED DAILY PROGRESS REPORT OF WORK DONE ON COLLIER "TUCKAHOE"

Day	Nature of Work Done	Tons of Steel	Total Tons Steel Set per Day	Rivets Driven per Day	No. of Men at Work: Day Shift	No. of Men at Work: Night Shift	No. of Men at Work: Total No. of Men per Day
1st	104 shell plates	151	293	.....	60	56	116
	Centerline keelson complete	30					
	160 floors	112					
2d	524 intercostal plates	58	76	1,004	104	79	183
	37 floors	18					
3d	10 shell plates	14	183	8,988	202	72	274
	18 floors	12					
	40 intercostal plates	5					
	91 inner-bottom plates	152					
4th	16 shell plates	23	138	11,790	324	64	388
	139 frames	71					
	5 web frames	26					
	Stringers Nos. 1, 2, 3, from bulkhead No. 13 to frame No. 27						
5th	26 shell plates	38	150	20,534	339	72	401
	11 frames	6					
	5 bbl.	100					
	Longitudinal bulkhead 14 ft. 0⅛ in. from centerline between frames Nos. 56-61	6					
6th	25 shell plates	37	88	6,756	377	68	445
	40 side frames	20					
	2 web frames	14					
	3 inner-bottom plates	5					
	1 watertight peak bulkhead	2					
	Gallery deck and beams complete	10					
7th	15 shell plates	21	127	20,645	363	75	438
	10 side frames	7					
	81 main-deck beams	49					
	35 main-deck plates	45					
	Stringer No. 1, frames Nos. 111 to 126, P. & S.; stringer No. 2, frames Nos. 98 to 111, P. & S.	5					
8th	14 shell plates	20	109	15,254	445	71	516
	Stern casting	11					
	28 main deck beams	28					
	Coal-bunker bulkheads and flat miscellaneous brackets under main deck	18					
	Side-plating of main-deck trunk	42					
9th	Bilge keel angle, frame No. 60 to No. 90, port; bilge keel, complete, starboard	3	95	18,682	518	71	589
	10 shell plates	14					
	Transom frame	4					
	W.T. peak bulkhead	7					
	38 frames	19					
	30 main-deck plates	40					
	13 main-deck beams	8					
10th	Bilge keel, complete, port	2	77	19,805	569	70	630
	Boiler-room casing and engine-room casing	28					
	Swash plates in after peak	2					
	1 main-deck plate	1					
	7 B.W.T. bulkheads on main deck at poop	10					
	49 frames at poop	5					
	20 shell plates	29					
11th	12 shell plates	17	53	20,151	579	54	643
	6 frames between main and poopdecks	1					
	Bulkhead at forward end of poop	5					
	Cant frames	8					
	Poopdeck beams and platings, complete	22					
12th	23 shell plates	33	105	19,543	583	73	685
	Channels on main-deck trunk combings	22					
	Houses and miscellaneous bulkheads on poopdeck	33					
	Engine and boiler casing above poop	15					
13th	15 shell plates, port base-plate	20	44	7,984	619	76	695
	14 frames, forward	6					
	Fore peak bulkhead	10					
	4 breast hooks	1					
	Chain locker and flat	7					
14th	7 shell plates	9	45	15,496	390	75	465
	6 frames at midship house	1					
	2 bulkheads at midship house	10					
	Bridge deck beams and plating, complete	6					
	Main-deck beams, Nos. 1 to 13	6					
	Main-deck plating, forward	13					

Day	Nature of Work Done	Tons of Steel	Total Tons Steel Set per Day	Rivets Driven per Day	No. of Men at Work: Day Shift	No. of Men at Work: Night Shift	No. of Men at Work: Total No. of Men per Day
15th	18 shell plates	26	131	20,499	675	76	751
	Forecastle frames and beams	3					
	Stem	2					
	Boilers shipped, starboard boss plates	100					
16th	6 shell plates	5	16	17,454	740	..	740
	Bulkhead at end of forecastle	3					
	Stringer No. 2, between stem and bulkhead No. 13	3					
	Bulkhead on port side of poop for armory	2					
	Hatch coamings, except No. 1 forward	3					
17th	13 shell plates	17	39	.....	792	..	792
	Bulwark brackets	5					
	Channels at hatch No. 1	2					
	Freeing ports	1					
	Forecastle-deck plating	7					
	Bulwark rails from frame 15 to 45, Nos. 73 to 91, port and starboard	4					
	Stringer No. 1, stem to bulkhead 13	3					
	Total		1,769	224,585			

Day	Nature of Work Done	Tons of Steel per Day	No. of Men Day	No. of Rivets per Day
18th	6 shell plates; Remainder of bulwark rails; Steel house amidship under way; Doubler for ash ejector B. & S.; Boring bar on rudder gudgeons P.M.	9	786	15,799
19th	6 shell plates; Stringer No. 3 from stem to bulkhead No. 13 B. & S.; Steel house amidship practically O. K.; Gun foundation fore and aft, under way; Ceiling in No. 2 hold under way; Wood deck on poop and bridge deck under way; Hatch battening bars O.M.; Boring of stern boss started 4:45 p.m.	16½	812	17,862
20th	Kingposts all in place; Ceiling in No. 2 hold O. M.; Wood deck on bridge deck, complete; Boring of stern boss complete at 6:15 a.m.	9	740	5,042
21st	Ceiling in No. 3 O. K.; Ceiling in No. 4 under way; Roller chocks, bitts and mooring pipes O. K. on main and forecastle decks; Steel house amidship complete; Tailshaft in place; Starboard launching ways greased and packing fitted	7½	504	10,502
22d	Single roller chocks and bitts on poop-deck; Winch founds. on main-deck trunk top; Ford keel plate; Smokestack foundation; Screen bulkhead under way; Masts; Wedging of masts, complete; Ceiling in No. 4 hold under way; Joiners in amidship house; Boring of rudder gudgeons completed a.m.; Engine bed plate in place a.m.; Port launching ways greased and packing fitted	16½	710	8,296
23d	Chain pipes in place; Hawse pipes and rings in place; Auxiliary machinery installed; Wood ceiling in No. 1 hold under way; Wood ceiling in No. 4 hold O. K.; Hatch covers Nos. 3, 5, 6 in place; Flying bridge O. K.; Screen bulkhead O.M.; Masts rigged; Propeller blades in place p.m.; Propellor hub in place a.m.	29½	682	9,197
24th	Armory on poopdeck, complete; Separate contract; Wood ceiling in No. 1 hold complete; Wood deck on poopdeck housetop under way; Hatch covers Nos. 2, 7, 8, O. K. in place; After gun foundation practically O. K. separate contract; Rudder shipped at 11 a.m.; Smokestack in place at 1:30 p.m.; Crankshaft in place at 2:15	29½	699	8,300
25th	Hatch covers Nos. 1, 4, O. K. in place; All deck winches complete; All booms shipped; Engine uprights in place at 11 a.m.; Engine cylinders in place at 3 p.m.; Staging cleared from sides of ship, except stern; Water-testing of ship completed	12½	609	7,632
26th	Pilot house in place; Wood house top aft well under way; W.T. doors under way; Booms rigged	...	616	4,695
27th	For'd gun found O.K. Separate contract; Holds Nos. 1, 2, 3, 4, painted with bitumastic; Engine skylight in place; Galley skylight in place; Boat davits in place	16½	587	2,572
28th	Ship launched at 10:27 a.m., 27 days from day of keel-laying, 276 men on launch.			
29th	Water-tight and N. water-tight doors completed	...	386	2,576
30th	Engine and galley skylights completed	...	371	3,131
31st	Coal in bunkers, p.m.	...	358	2,269
32d	Engine and fireroom floors installed	...	372	3,108
33d	Fire in boilers 2:15 p.m.	...	356	2,673
34th	Sliding and construction doors completed	...	302	1,447
35th	Completing odd work	...	118	2,711
36th	Dock trial of engine 11:20 a.m.	...	249	1,310
37th	Completing odd work	...	208	648
38th	Ship complete and turned over to owners at 9 a.m.			
39th	Ship left New York Steel Corporation pier at 12:40 p.m.			

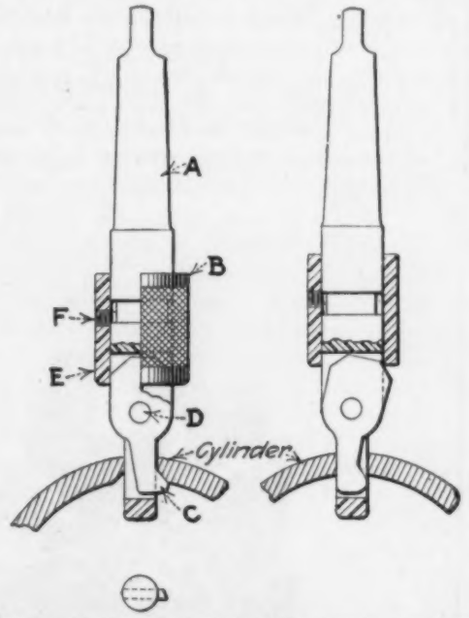
Total number of rivets, 349,123. Masts, skylights, bulkheads and king posts not included in this number.

Number of hours—Hull erection, 265,000 hours; total to complete ship, 424,190 hours.

Countersinking Tool for Cylinders

BY WALTER P. LOTZ

The illustration shows a quick method of countersinking holes on the inside of long cylinders. *A* is the shank which fits into the drilling-machine spindle. The cutter *C* is inserted in a slot in the lower end of the shank and pivoted on the pin *D*. By raising *E* the



TOOL FOR COUNTERSINKING ON INSIDE OF CYLINDER

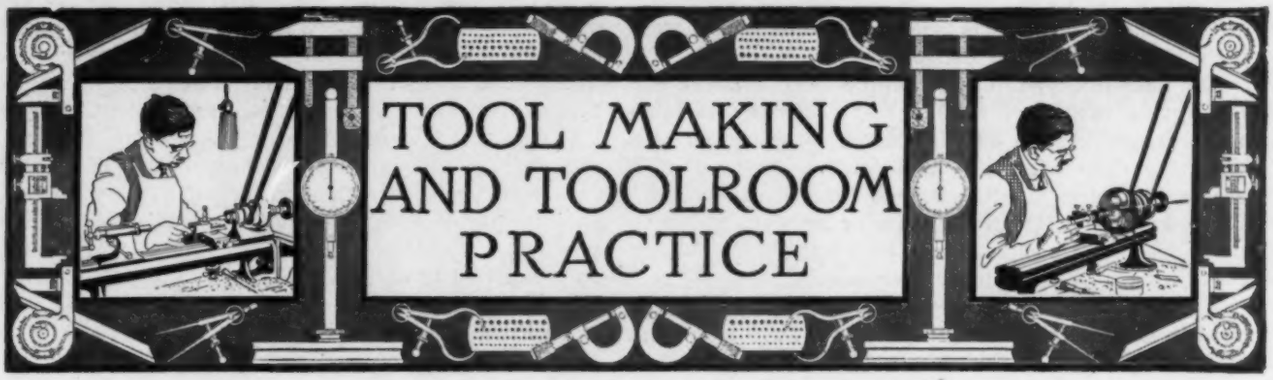
cutter *C* disappears into the slot and allows the tool to enter the cylinder. When the pilot is in the cylinder the sleeve *E* is slipped over the upper end of the pivoted cutter, forcing it into position to countersink. The spindle of the machine is raised to bring cutting edge in contact with the work in the particular instance illustrated. This tool can be operated while spindle of drill press is revolving, as the pin *F* that limits the up and down travel of the sleeve *E* runs in a groove around the shank.

FIG. 1. FIVE-TON ARTILLERY TRACTOR, MODEL 1917

Caterpillars for Field Artillery

THESE pictures, which are copyrighted by the Committee on Public Information, will give an idea of how field artillery is handled quickly over the shell-torn fields of France. Fig. 1 gives a side view of one of the tractors and Fig. 2 shows one in actual use. These machines are known as 5-ton artillery tractors, Model 1917, and are supplied to the 6-in. and 9.2-in. howitzer regiments.

FIG. 2. TRACTOR PULLING A LOAD OVER ROUGH GROUND



Flush-Pin Versus Limit Gages

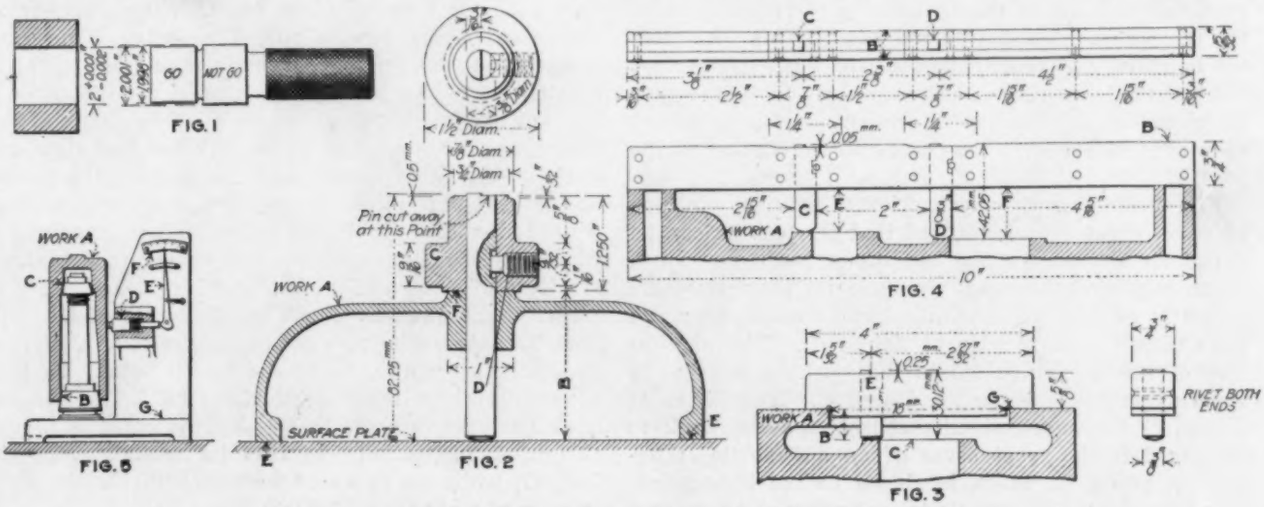
BY ALBERT H. DOWD

Flush-pin gages are coming into more extensive use, especially for gaging the relative position of one surface to another. For gaging diameters of holes and cylindrical pieces nothing has been devised to supplant plug and snap limit gages. This article describes several types of flush-pin gages, both for work and inspection, and gives examples of their use.

LIMIT gages, as ordinarily applied to the manufacture of interchangeable work, leave much to be desired, especially when the product is such that it must be kept within very close limits of accuracy. Even when the tolerances permit considerable variation in the work the ordinary go and no-go limit gages are more or less unsatisfactory for the reason that they do not determine the fluctuations in the work sizes to any appreciable degree. Take as an example a cylindrical hole such as that shown in Fig. 1. This is a 2-in. hole which can be 2.001 in. to 1.998 in., according to the tolerances specified.

Let it be assumed that the hole is machined to a dimension of 1.9985 in. In this case it is evident that the piece will pass inspection because the go portion of the gage is 1.998 and therefore it will enter the hole freely, while the no-go portion, being 2.001, will obviously not enter the hole. Now if the work were to be machined so that it actually measured 2.0005 it would still pass inspection; yet in either of the two cases mentioned the work would be verging close to the danger line without the operator being aware except by the feel of the gage as he entered it in the hole. After approaching the danger line the very next piece of work might not pass the gage, due to the wear of the tools, and if the operator were inclined to be careless, three or four pieces might vary sufficiently to need reboring before the error became apparent.

In turning work and in facing to depth where limit snap gages are in use the same trouble might develop; likewise in straddle milling and in face and gang milling the same conditions may exist. Now, in boring and turning, nothing up to the present has been suggested to take the place of plug and snap limit gages, and they are used with more or less success throughout the country. For gaging depths, shoulder distances and work of this kind, however, there is no good reason why another type of gage should not be used more extensively—a gage which will act as a limit gage and



FIGS. 1 TO 5. PLUG AND FLUSH-PIN GAGES

Fig. 1—Plug limit gage. Fig. 2—Flush-pin inspection gage. Fig. 3—Flush-pin work gage. Fig. 4—Flush-pin gage for two surfaces. Fig. 5—Flush-pin gage with indicator

at the same time show the machine operator how closely he is approaching the danger line.

The flush-pin type of gage can be used to advantage on a great variety of work and it has many valuable features. It is used to a considerable extent on gun work for close tolerances, and can be made up at a reasonable price. In its simplest form it can be used for tolerances of about 0.005 in. or greater, and with additional refinements it can be made to indicate a fluctuation of 0.0005 in. or even less.

A very simple and inexpensive type of flush-pin gage used to determine a facing depth for a light aluminum casting is shown in Fig. 2. In this case the work *A* has been milled along the flange *E* and faced on the boss *F*. The manufacturing requirements permit a tolerance of 0.5 mm. in the depth *B*.

The gage itself consists of a knurled guide *C* in which the flush pin *D* operates easily as a sliding fit. The small screw indicated in the illustration is to prevent the gage pin from becoming lost by dropping out of the guide. The upper part of the pin is cut away to the amount of the tolerance desired. In use the work is laid flange side down on a surface plate and the gage pin is dropped into the hole. The degree of projection of the shouldered end of the gage pin above the top of the gage indicates clearly whether the work has been properly machined or not. At the same time observation will show in which direction the variation tends to take place so that suitable provision can be made in the tools to counteract error.

Flush-Pin Work Gage

The application of the flush-pin principle in gaging a piece of work during machining is shown in Fig. 3. In this case the work *A* must be machined so that depth *B* will be within a tolerance of 0.25 mm. This gage is on the same principle as that of the previously described instrument, but as the work is recessed, provision is made in the shoulder *G* to roughly center the tool when placing it in the work. This facilitates the handling and roughly locates the flush pin against the face of the casting *C*. The registration of this gage is by means of the pin *E*, which is shouldered, as shown, to indicate the variations in the facing of the boss *C*.

Fig. 4 shows another application of the flush-pin type of gage, which is so arranged that two depths can be gaged simultaneously and variations readily detected. In this instance the gage is made up from two side pieces *B* of flat stock, with fillers between them and flush pins *C* and *D*, also of flat stock. The application of the gaging points to the work is exactly the same as in the other cases described. The distances *E* and *F* are gaged simultaneously, and the work to be gaged is the front cover of an automobile crankcase, a profile of which is shown in the illustration. For long gages this type is to be preferred on account of its weight and convenience, which makes it less clumsy and easier to handle. The expense of manufacture is not greatly different from the other type.

The flush- or push-pin principle can be applied to work requiring closer tolerances than in the instances shown by the addition of an indicator multiplying lever in connection with a suitably graduated scale, as shown in Fig. 5. In this case the work *A* is to be gaged for concentricity with a permissible variation of 0.002 in. The piece is located on the taper sleeve *B* and the movable spring-supported conical member *C*. The support for these members revolves easily so that when the work is placed in position it can be readily turned around by the inspector. The gaging fixture is furnished with a spring pin *D*, which actuates an indicator lever *E* pointing to a scale *F* and giving readings of 0.001 in. The entire mechanism is mounted on a substantial base *G*, which rests on the inspector's bench. Other applications of this principle can be easily made to suit special conditions.

Growth of the U. S. Patent Office

George W. Evans, a veteran employee of the Interior Department, at a recent meeting of the Columbia Historical Society in Washington, read a paper on "The Birth and Growth of the Patent Office" from the issuance of the first patent right to Samuel Hopkins on a baking pot in 1790 down to the present day when there are 1,077,760 individual records in that office.

The Interior Department, although it bears no direct relation to war, is doing much war work, Mr. Evans declared. The Patent Office, he said, is searching back through the inventions of the last 20 years to see if in some obscure pigeonhole there is any device which might hasten the end of the German military masters and which has not been fully appreciated.

The patent system, said the speaker, had its origin in England, where the king granted monopoly rights to individuals purely on the basis of favoritism or for some service rendered the government. In 1623 James I put a stop to the arbitrary system by issuing letters of testimony to the first inventor to present himself.

The United States Patent Office had its beginning in 1790, when a commission of three passed on the devices and the President signed the patent papers, which were good for a period of 14 years. After that period the patent rights became public property. This commission had broad powers, including the right to reject a patent. These powers were curtailed in 1793, when a new act placed the patent business in the hands of the Secretary of State. For 12 years after that date one clerk in the State Department handled all the patent business of the United States in a dozen pigeonholes, while today 1000 employees in a building occupying a whole city block are kept busy recording the countless creations of American minds, said Mr. Evans.

Mr. Evans dwelt at length on the career of Dr. William Thornton, who was named by President Jefferson in 1802 to assume charge of the Patent Office. He held the position until his death in 1828. The speaker quoted figures to show that today the office is a self-sustaining institution. In 1917 its receipts were $2,258,377, while its expenses were $2,048,173, leaving a balance of more than $200,000.

In recounting various inventions of note first recorded in the United States Patent Office Mr. Evans said that while Marconi has been heralded throughout the world as the inventor of the wireless, Prof. Silas L. Loomis of Washington, D. C., was given the first patent on a wireless invention about 1878, but was unable because of circumstances to perfect his device, and also because at that time the public was skeptical of its possibilities.

The Manufacture of Welded Pipe

By S. A. Hand
Associate Editor *American Machinist*

To many users of pipe little is known about the process of its manufacture. While this article is not intended to be a scientific treatise on pipe manufacturing it describes and illustrates the methods used by one of the large plants.

UPON visiting the plant of the National Tube Co., McKeesport, Penn., I was impressed with the immaculate cleanliness, neatness and order of everything in and about the mills and yards, the complete arrangements for the safety of the employees and the magnitude of the plant. There is absolutely no litter to be seen anywhere. Everything not in use is stacked away in the neatest and most orderly manner, and all the walks in and around the mills and yards are cleaner than many city sidewalks. The machines in the mills are well protected against accidental contact with dangerous parts and even the ball governors of stationary engines revolve within heavy wire cages. Inside the mills foot bridges span places where it would be dangerous to walk on the floor level. The head and tail lights of every locomotive have painted on their glass the slogan "Safety First" in letters large enough to be plainly read by night and by day, and tracks that must be crossed by the employees in entering and leaving the works have a tunnel, as may be seen in Fig. 1. From the prehistoric reeds, the Egyptian and Aztec ducts of pottery, the crude stone and lead pipes of the Greeks and Romans and the bored logs of our forefathers to the welded pipe of the present day the history of pipe making is an interesting story of progress. While that story is not germane to an article of this kind a few facts regarding the material from which modern welded pipe is made may be given with propriety.

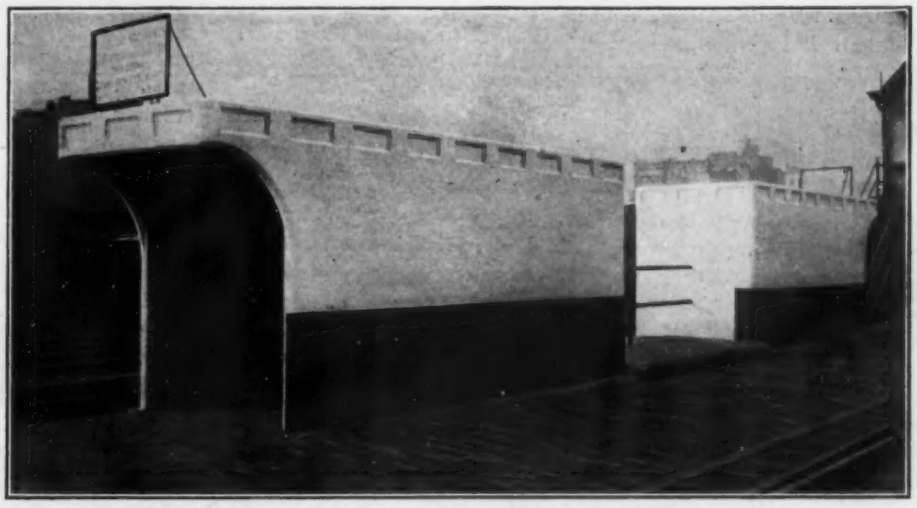


FIG. 1. TUNNEL UNDER TRACKS

The material used in the first welded pipe was wrought iron, and as late as 1890 probably 90 per cent. of the pipe made was of that material. As the Bessemer process of making low-carbon steel came into more extended use some pipe was made from it as an experiment. This proved so successful that its use increased until at the present time it is safe to say that 90 per cent. of pipe is made from Bessemer steel. The metal must be uniform and easy to weld, and when made into pipe should be capable of taking a good thread without difficulty and must have the maximum strength consistent with these qualities.

When steel pipe first came into use it was said that it was almost impossible to cut a good thread on it. This was undeniably true when dies were used that had been made for threading wrought-iron pipe, but dies having proper lip, clearance, chip space, throat and a sufficient number of cutters or chasers will not only thread steel pipe as easily, as well and as rapidly as iron pipe was threaded with the old dies but will cut a better thread on iron pipe than was ever done with the old-style dies. Many pipe makers buy their plate and skelp in the open market, and as they have no control over its manufacture they cannot be assured of uniformity of their finished product.

The steel from which pipe is made at the National plant is the product of their own blast furnaces and converters, and furthermore every pound of the output is used solely in the production of pipe. Thus they

have absolute control of the quality and uniformity of their product at all stages of its progress. The plant occupies 104 acres, and one building alone, the tube mill, has a roof area of more than 20 acres and is believed to be the largest manufacturing building under one roof in the world. Pipe is made from flat plates, or sheets, rolled to the proper gage, width and length for the particular size and kind of pipe to be made. When used for making butt-welded pipe these plates are known as skelp, but for some unknown reason when used for making lap-welded pipe they are not known as skelp until after they have been bent into the form of tubes.

For butt-welded pipe the edges of the skelp are slightly beveled so they will meet squarely when bent into tubular form. Also one end is partially pointed by clipping off the corners at an angle of about 30 deg. from the center line so that it will more readily enter the bending and welding die or bell seen in Fig. 2. The heating furnace is long and narrow and has openings at both front and rear, the skelp being loaded through the rear opening. In front of the furnace is a long draw bench on which, close to the front opening of the furnace, is mounted the bell. In the center of the bench is an endless chain that runs over two sprocket wheels placed at separate ends of the bench, one of which is continuously driven by power. The tongs are quite long and the rear end is bent at a downward right angle so that it may be hooked into the endless chain.

The skelp being at a welding heat the furnace tender pulls it forward so that the pointed end enters the mouth of the bell *A*, Fig. 3, and the welder reaching the tongs *B* through the rear of the bell grips it and pushes the hook on the end of the tongs down between the links of the moving chain. Thus the welding-hot skelp is drawn out of the furnace and through the bell at a rapid rate. It gradually takes the form of a tube and the abutting edges are forced together and solidly welded. When the whole length of skelp has passed through the bell the tongs are detached from the chain and the now welded pipe released from their grip. The pipe is now passed through a pair of rolls, Fig. 4, each of which has semicircular groove of the same radius as the outside of the finished pipe. These rolls size the pipe and remove any irregularities that may have been caused by welding.

FIG. 3. BENDING AND BUTT WELDING

From the sizing rolls the pipe passes through a pair of long rolls whose surfaces are curved to an hourglass shape and are mounted with their axes set at an angle with each other. The curves in the roll surfaces in relation to the angle of their axes inclination are such that the pipe has a bearing practically along the whole surface. As these rolls rotate, the pipe revolves rapidly and at the same time passes forward. This straightens the pipe, gives it a clean finish and leaves it with a thin but firmly adhering scale.

After leaving the straightening rolls the pipe is passed on to and is rolled up an inclined cooling table, Fig. 5, where it cools slowly. When cold the ends are cut off and threaded and it is then ready for testing. Every piece of butt-welded pipe must be subjected to an internal hydrostatic pressure of from 700 to 2200 lb. per square inch, according to its size and des-

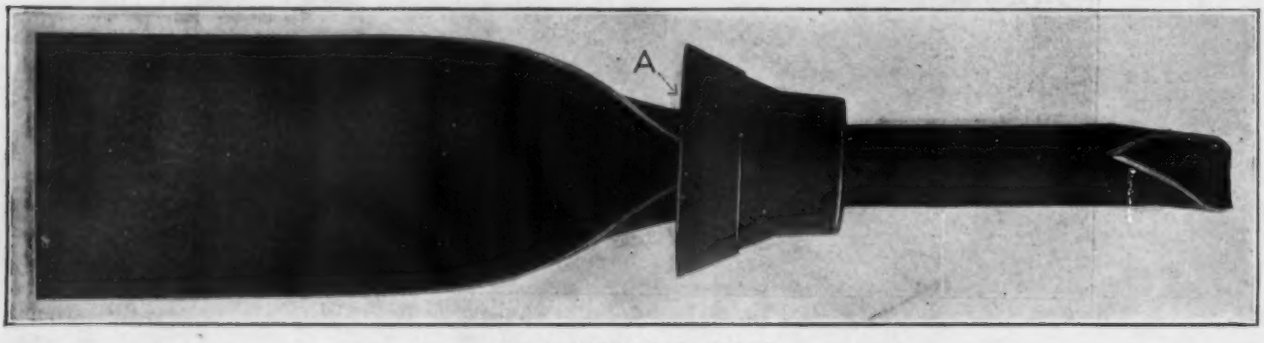


FIG. 2. BELL AND SKELP

ignated strength. Butt-welded pipe less than 2 in. in diameter is made into a bundle and tagged with the number of lineal feet contained therein. Each piece of pipe over 2 in. in diameter is stenciled with the tester's mark and its length. Some of the larger sizes of

FIG. 4. SIZING ROLLS

butt-welded pipe are drawn through two bells set tandem, the last bell being slightly smaller than the first. This causes the abutting edges to be more firmly pressed together and insures a better weld.

In butt welding extra-strong and double extra-strong pipe it is drawn through several bells of decreasing size (being reheated between each draw), as the strain of bending and welding skelp of the required thickness is too great for this to be done at a single pass. Furthermore a strong bar is welded to the skelp end for a tong hold, otherwise there would be danger that the tongs would tear the skelp at the gripping point.

Standard and extra strong butt-welded pipe is made in sizes of from $\frac{1}{8}$ in. to 3 in. and double extra-strong from $\frac{1}{4}$ in. to $2\frac{1}{2}$ in.

The plates from which lap-welded pipe is made are beveled on their edges so that when overlapped and welded the seam will be neat and smooth. The process of manufacture differs from that of butt-welded pipe in that the bending of the plates into tubular form is done in a separate operation and the welding is done over a ball or mandrel and between rolls instead of through a bell.

Plates for pipe of standard length (20 ft.) up to 10 in. in diameter and double length (40 ft.) up to 12 in. in diameter are bent into tubular form by hot drawing through dies, Fig. 6, similar to the bells used in butt welding. All other sizes are bent in rolls similar to those used for bending boiler plates. The plates so bent, and now known as skelp, are brought to a welding heat in a long furnace similar to the one used for butt welding and are pushed out of the furnace into a pair of welding rolls *A*, Fig. 7, each of which has a semicircular groove corresponding to the sizes of the pipe to be welded. A cast-iron ball or mandrel *B* similar in shape to a conical bullet and of the same size as the internal diameter of the pipe to be welded is mounted loosely on the end of a long, stout rod *C* firmly supported at the rear. In welding, the ball is positioned between the rolls, as shown, so that the skelp in passing through them must also pass over the ball. Thus the ball supports the inside while the rolls crowd the overlapped edges down onto it and welds them solidly together. At the same time the lap is reduced to the original thickness of the skelp. After the pipe is welded

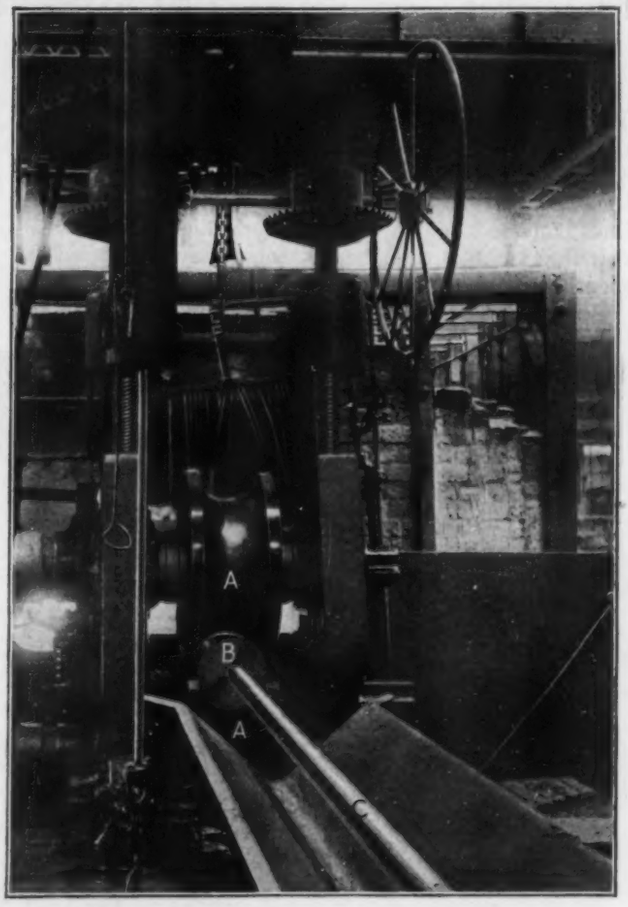


FIG. 7. WELDING ROLLS, ROD AND BALL

the rod is withdrawn and the ball drops off. The after processes of sizing, straightening, cutting off, threading and testing are similar to those in butt-welded pipe and need no further description.

Double extra-strong or hydraulic lap-welded pipe is made from two tubes, one of which is telescoped within

FIG. 5. COOLING TABLE

the other with the welds placed diametrically opposite. They are brought to a welding heat and again passed through the welding and subsequent processes the same as pipe of standard strength. Double extra-strong pipe thus made is stronger in respect to internal pressure than if made of one ply of the same thickness, notwithstanding the fact that the two tubes may not be welded together at all points between their surfaces.

Standard lap-welded pipe is made in sizes from 1¼ in. to 15 in. inside diameter and from 15 in. to 30 in. outside diameter; extra strong from 1½ in. to 15 in., and double extra-strong from 3 in. to 8 in. Lap-welded pipe is tested at a hydraulic pressure of from 600 to 3000 lb. per square inch, according to its size and the purpose for which it is intended. All pipe heavier than standard has the same outside diameter as standard pipe of that nominal size, the internal diameter being smaller by twice the extra thickness of the metal used.

FIG. 6. BENDING PLATES INTO SKELP FOR LAP-WELDED PIPE

The Testing of Lubricants

By Raymond Francis Yates
Associate Editor *Everyday Engineering.*

This article explains the various characteristics of lubricating oils and greases and how they may be tested with simple apparatus. To the large manufacturer this is quite important, as oil is always purchased in quantities and it is generally desired to obtain uniform grades.

IT REQUIRES no great skill or elaborate apparatus to make reasonably accurate determinations on the properties of oil. The apparatus used need not represent an outlay of over a few dollars. An important property of oil is its viscosity, and of all the various tests applied to lubricating oils it is the only one that will give any indication of its lubricating value. By

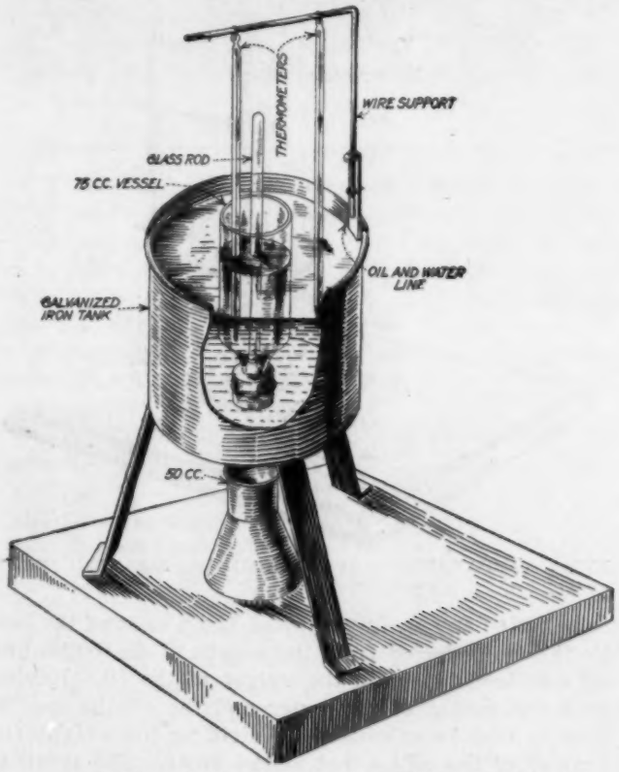


FIG. 1. AN EASILY MADE VISCOSIMETER

viscosity is meant the degree of fluidity, and this depends somewhat on temperature—the higher the temperature the less the viscosity and vice versa. The viscosity of an oil is really its internal friction, or in other words its molecular friction, and can generally be determined by permitting it to flow through an orifice or opening of a definite size. The oil is brought to a certain temperature and the time in seconds that it requires to pass through the orifice is carefully recorded. A heavy oil will require considerable time, while a light oil will pass through very quickly. The instrument used to make this test is called a viscosimeter, and while the standard market forms are quite costly a serviceable makeshift capable of giving very accurate determinations can be easily constructed at slight expense.

A simple viscosimeter is shown in Fig. 1. Unless the proper facilities are at hand I would advise the builder to order the various necessary glassware from a reliable chemical-supply house. The opening at the bottom of the 75-cc. vessel is the proper size to permit 50 cc. of water at 60 deg. F. to pass in 15 sec. Two thermometers are suspended as shown, one in the glass vessel and the other in the outer galvanized-iron tank. The aperture at the bottom of the glass tube is opened and closed by means of the long glass rod, which has a short piece of rubber fixed to its end to prevent leakage.

To use this viscosimeter the following process should be observed: Fill the glass vessel to the line with 75 cc. of the oil to be tested. (This line should be ground on by the makers of the vessel.) Then fill the outer metal tank with water so that the level of the water will be the same as that of the oil. Now apply heat to the water for a short time and withdraw it, thereby permitting the oil to catch up, as it heats much more slowly than water. It may be necessary to do this several times before the temperature of the oil and the water is the same, which is essential. It is advisable to gently stir the water in the tank with a glass rod

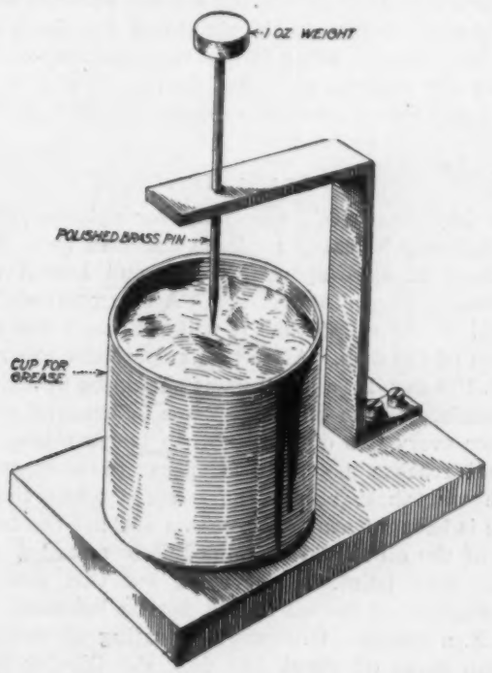


FIG. 2. METHOD OF TESTING RELATIVE CONSISTENCY OF GREASE

while it is being heated. The thermometers will indicate the temperatures of both the water and the oil at the same time. When the temperature of both is at exactly 65 deg. F. the plug is withdrawn and 50 cc. of the oil is permitted to run out in a flask of this capacity. At the instant the plug is withdrawn a stop watch is started and as soon as the 50-cc. flask is filled

the watch is stopped. Knowing the time required for 50 cc. of water to run out we can readily calculate the "specific viscosity." When a new consignment of oil is received it can be easily proved by the viscosimeter whether or not it is the same as that previously furnished.

Before testing another sample the viscosimeter should be thoroughly cleaned. Cleaning cannot be accomplished with water, but should be done with a swab of dry cotton and gasoline.

Acid Test

Many oils come from the refiner contaminated with acid, which is a very dangerous constituent of oil. If too much is present the oil will have a disastrous effect upon the bearings. In fact oil which gives indication of containing acid in the test that follows should be regarded with extreme caution.

A small amount of the oil to be tested is placed in a test tube with a little hot water and thoroughly shaken. If acid is present it will tend to form a solution with the water and thus it may be more readily detected. After the shaking is accomplished the tube is left to stand a moment until all the water settles. The oil is then poured off and the water tested with neutral litmus paper. If an appreciable amount of acid is present the litmus paper upon being immersed in water will immediately turn a distinct red, denoting the presence of acid, which as has been explained is ruinous to the bearings.

Another test which, however, requires a longer time may be carried out by placing a small polished sheet of pure copper in the oil, the weight of the sheet having been first taken. After it has remained in the oil for a week it is weighed again and the loss, if any, recorded. Sometimes the oil contains so much acid that the copper will be visibly corroded.

Flash Test

An important test, especially for cylinder oil, and one that may be easily made, is the flash test. The oil is placed in an evaporating dish and heated with a Bunsen burner or blow torch. A thermometer is suspended in the oil so that it will not touch the side or bottom of the dish. After the temperature has reached about 150 deg. F., a small flame should be brought near the surface of the oil. The flame is brought near the surface every two degrees' rise in temperature. When the oil reaches a certain temperature a snappy blue flame will shoot across the surface when the small flame is brought near. When this appears the temperature of the oil should be immediately recorded, as this is the flash point. In carrying out this process the temperature of the oil should not be increased over 8 deg. F. a minute. Ordinary lubricating oil should have a flash point of about 350 deg. F. Oil for cylinder lubrication should not have a flash point below 500 deg. F.

If the temperature of the oil is carried higher and the flame applied at regular intervals the flame appearing on the surface of the oil will soon fail to automatically extinguish itself and will continue to burn. This is called the burning point, and the temperature of the oil should be recorded again. Usually the burning point is but a few degrees above the flash point.

While the flash test is a fair indication of the volatility of an oil the evaporation test will supply more reliable information concerning this property. Place a sample of the oil in an evaporating dish and carefully weigh. The dish is then placed in a closed compartment and heated to a temperature of 212 deg. F., which is to be maintained for 24 hours, when the sample of oil is to be again weighed. The loss in weight will tell just how volatile is the oil. Usually between 0.25 and 0.15 per cent. is the amount of decrease, and an oil losing over 3 per cent. is of very poor grade. In determining the evaporation of cylinder oils the temperature should be maintained at 350 deg. instead of 212 deg. F.

To get the specific gravity a flask is weighed, and after being filled with water it is again weighed. The weight of the bottle is then deducted from the weight of the bottle and water combined. This will give the weight of the water. The bottle is then filled with the oil

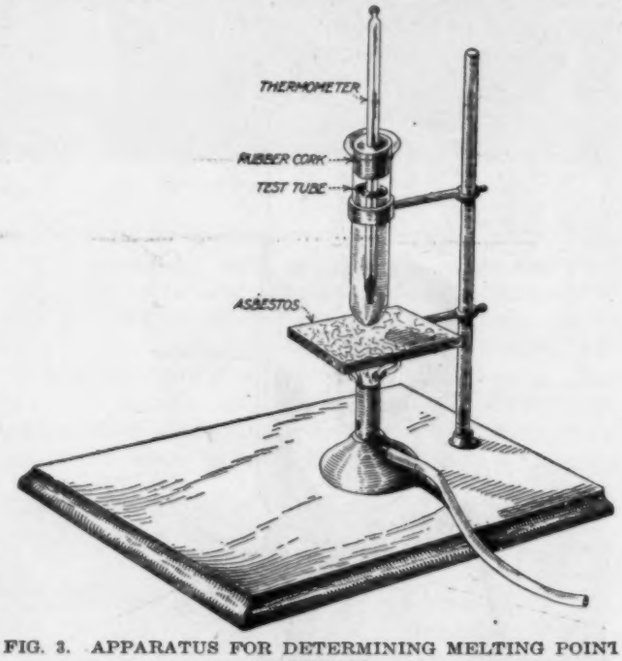


FIG. 3. APPARATUS FOR DETERMINING MELTING POINT OF GREASE

to be tested and again weighed. The weight of the bottle is then deducted from the weight of the bottle and oil combined to obtain the weight of the oil. Having both the weight of the water and the oil the specific gravity may be calculated by dividing the weight (in grams) of the oil by that of the water. The result is the specific gravity.

The consistency test for grease compares with the viscosity test for oil. It is a very simple determination carried out with simple apparatus, yet it tells much. An easily constructed instrument for making this test is shown in Fig. 2. A brass pin 3 in. long has a 1-oz. weight attached to the blunt end. The pin fits loosely in the bearing or hole of the arm. The small glass vessel filled to the brim with the grease to be tested is placed so that the point of the pin will come to bear upon the center of the surface of the grease. As the point touches the surface, it is permitted to bear its own weight. The number of seconds that is required for this brass pin to sink to the bottom of the grease is the relative consistency of the fat or grease. The

sample of grease in the cup should be subjected to a temperature of 65 deg. for at least five hours before the test is made. The brass pin should also have a high polish on its surface and the point should be made quite sharp.

A sample of grease is melted in a dish and a cold thermometer is immersed in it for an instant. When the thermometer is taken out it will be found that a small portion of the grease has congealed and remained on the tip. The thermometer is suspended in a test tube and heated as shown in Fig. 3. It is carefully watched and when the temperature reaches a certain degree the grease will form a drop and precipitate to the bottom of the test tube. When this happens the temperature should be noted, as this is the melting point.

Measuring Gears by the Use of Wires

By WILLIAM S. HUDSON

Practically everyone connected with the production of accurate tool work is familiar with the method of measuring and testing of screw threads by means of wires and the micrometer. Possibly, by reason of the more complicated formulas involved, this method is not so generally applied to the measurement of gears, and it is with a view to removing some of these difficulties that the formulas and tables in this article are presented.

THE wire, or pin, method of measuring gears, as it is generally known, is to set two pins in opposite tooth spaces, touching adjacent teeth, and to measure across the outside of the pins. The diameter of pins is such that they touch the teeth on the pitch circle.

The advantages of this method are that the pitch diameter of a gear can be measured without the use of expensive gear-testing fixtures and without removing the gear from the gear-cutting machine. The reasons why it is not more widely used are that a fairly good knowledge of gear-tooth theory and mathematics is required to figure out the requisite diameter of pin, a different diameter of pin is required for each number of teeth for any pitch, and when the pin diameter is found the formulas for obtaining the actual pitch diameter are sufficiently complicated to deter the average machinist from attempting to use them. The method given here simplifies all these calculations and offers a reliable means of measuring gears.

Before the time of the gear shaper and the hob the width of tooth or tooth space was the acknowledged standard for measurement of pitch diameter. Now, however, generating methods give us accurate involute tooth curves and allow us to take our measurements from adjacent parts of the tooth. Let us then make our pin diameter such that the center line of the pin lies on the pitch circle.

In Fig. 1, OA is the center line of the tooth space, O being the center of the gear and A the intersection of the center line and the pitch circle. B is the point where the tooth curve cuts the pitch circle. The addendum, pitch, base and dedendum circles are as shown. AC and BD are tangents to the base circle, N is the number of teeth, P is the diametral pitch, and d is the diameter of the pin.

From the involute theory it follows that the angle BOD is equal to the pressure angle, which we will call α. E is the point of contact of the pin and tooth curve. The triangles AOC, BOD, are equal in all respects, so that $AC = BD$.

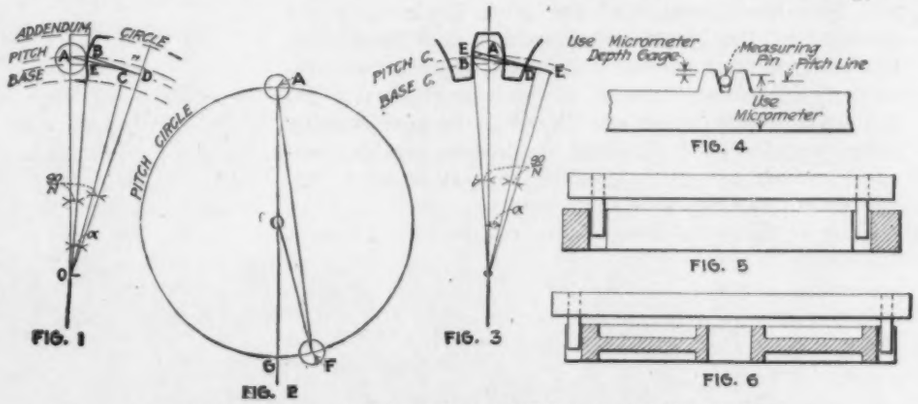
From the analogy of the unwinding string it will be seen that CA is normal to the curve at E. Thus $BD = EC +$ the arc CD, and $AC = AE + EC$, so that $AE =$ the arc CD. Now $OA = OB = \frac{N}{2P}$ and $OD = OB \cos \alpha, = \frac{N}{2P} \cos \alpha$.

The angle $COD =$ the angle $AOB, = \frac{1}{4} \times \frac{360}{N} = \frac{90}{N}$, so that arc $DC = \frac{90}{N} \times (2\pi \frac{N}{2P} \cos \alpha) = \frac{1}{4N} \times \frac{\pi N \cos \alpha}{P} = \frac{\pi}{4P} \cos \alpha$.

Therefore $AE = \frac{\pi}{4P} \cos \alpha$ and d (diameter of pin) $= \frac{\pi \cos \alpha}{2} \div P$.

Where $\alpha = 14\frac{1}{2}$ deg. $d = 1.521 \div P$. Where $\alpha = 20$, $d = 1.476 \div P$. Note that the diameter of the pin is entirely independent of the number of teeth in the gear and is constant for all gears of the same pitch.

When the number of teeth is even the diameter of



FIGS. 1 TO 6. MEASURING GEARS BY MEANS OF PINS

Fig. 1—Position of pin. Fig. 2—Measuring odd number of teeth. Fig. 3—Measuring internal gear. Fig. 4—Measuring a rack. Fig. 5—Gage for internal gear. Fig. 6—Gage for external gear

the pitch circle = measurement across outside of pins — diameter of one pin. When the number of teeth is odd a little further calculation is required.

TABLE I.

No. of Teeth	Sec. $\frac{90}{N}$	No. of Teeth	Sec. $\frac{90}{N}$	No. of Teeth	Sec. $\frac{90}{N}$
13	1.0073	27	1.0017	41–43	1.0007
15	1.0055	29	1.0015	45	1.0006
17	1.0043	31	1.0012	47–53	1.0005
19	1.0034	33	1.0011	55–57	1.0004
21	1.0028	35	1.0010	59–67	1.0003
23	1.0023	37	1.0009	69–85	1.0002
25	1.0020	39	1.0008	87–139	1.0001

In Fig. 2 *OA*, as before, is the center line of the tooth space. *AG* is a diameter, making *OG* the center line of the tooth directly opposite the tooth space at *A*. *OF* is the center line of the adjoining tooth space, *F*, on the pitch circle, being the center of the measuring pin. Now *AF* = measurement across outside of pins — diameter of one pin. The angle *GAF* at the circumference = ½ the angle *GOF* at the center = $\frac{1}{2} \times \frac{360}{2N} = \frac{90}{N}$. The angle *AFG* is a right angle. *AG* = $\frac{AF}{sin\ \frac{90}{N}} = AF\ sec\ \frac{90}{N}$. *AF* is found by direct measurement. Table I gives the value of $sec\ \frac{90}{N}$ for different numbers of teeth. With odd numbers of teeth, provided that care is taken to have the blank run true with the arbor and the outside diameter of the blank is measured before cutting, the pitch diameter can be calculated as follows:

Use one pin and measure from the outside of the pin to the outside of the blank on the opposite side. It will be seen that this measurement is the radius of the pin + ½ the diameter of the pitch circle + ½ the diameter of the blank. From which it follows that: Diameter of pitch circle = 2 × micrometer measurement — (diameter of blank + diameter of pin). This method is especially useful on the Fellows gear shaping machine as the pitch diameter of the gear can be measured as soon as one full tooth space is finished, and adjustment can be made if necessary.

Table II shows the sizes of pins required for different pitches.

TABLE II.

Pitch	Diameter of Pin 14½°	Diameter of Pin 20°	Pitch	Diameter of Pin 14½°	Diameter of Pin 20°
1	1.5208	1.4761	7	0.2029	0.2109
2	0.7604	0.7380	8	0.1901	0.1845
3	0.5069	0.4920	9	0.1689	0.1640
4	0.3802	0.3690	10	0.1521	0.1476
5	0.3041	0.2952	11	0.1382	0.1342
6	0.2535	0.2460	12	0.1267	0.1230

To avoid confusion no reference has been made thus far to internal gears, but the principles involved are exactly the same. Fig. 3 shows how the problem may be solved for an internal gear. This figure is lettered in such a way that the explanation of the external-gear problem may be followed out by referring to this figure instead of Fig. 1. The pin diameter is thus found to be the same as for an external gear. The gear may be measured by clamping the pins in opposite tooth spaces, so that a portion of each pin projects above the face of the gear, and measuring across the outside of the pins with a vernier caliper. The calculations for odd teeth will be the same as for an external gear.

This pin may also be used to measure the depth of pitch line of a rack, as shown in Fig. 4, either by measuring from the top of the tooth to the pin with a micrometer depth gage or by measuring from the back of the rack to the opposite side of the pin with a micrometer. A pair of pins that can be used to measure internal or external gears or a rack should have a place in the tool chest of all gear-cutting machine operators.

Where a large number of gears is to be cut a simple gage can be made by boring two holes at the required center distance in a suitably shaped holder and pressing the pins into these holes as in Figs. 5 and 6.

A Roller Back Rest

BY GUSTAV KOPSCH

The little scheme here described and illustrated has been used by me with good success and has shown no appreciable wear during several months of the hardest usage.

In turning nickel steel in a Jones & Lamson machine it was impossible to prevent "freezing" of the material to the V back rest, which is a part of the regular machine equipment. Of course one of the large roller back rests as furnished by the Jones & Lamson Co. might have been installed, but I decided to use the ordinary V back rest.

Two holders *A* were made of cold-rolled steel and pack hardened, two rollers *B* of tool steel hardened and ground, and the two pins *C* of drill rod. The pins have a shallow groove, as indicated in the sketch, so

A ROLLER BACK REST

that the oil, which runs freely during the cutting operation, can lubricate the whole attachment. The pin is a slide fit in the rollers and drives in the holders. The rollers are slightly rounded at the corners. The whole thing requires about half a day's time to make, but it saves a whole lot of trouble from marred work, and since it can be used for any diameter it needs no adjusting except just pushing both halves against the piece which has been previously turned to size. I have found this to be a very simple and inexpensive device for this purpose.

II. Miscellaneous Operations

The previous article described the machine operations employed in shaping the brier root into a pipe. This article gives a description of the operations of polishing the pipe bowl and making and finishing the stem, and also describes the manufacture of cases. Some of our readers may have suggestions to offer in the way of automatic machinery for this work.

AFTER the pipe stems have been drilled the bowls are ready for the sandpapering room where all of the marks left by the frazing machine are removed by successive operations on high-speed sandwheels. A general view of this room is shown in Fig. 18. Many kinds of wheels are used for this work. One of these, in Fig. 19, shows how the sandpaper is molded upon a round-edged disk to get the right shape of polishing surface for certain forms of pipes. The first of these operations is done with a coarse grade of sandpaper to remove the surplus material rapidly, and is followed by others using paper of progressively finer grain until a very smooth surface is obtained. Although this work is light, all the operators in this department are men and boys, because the work is dirty and dusty and the New York state law prohibits the employment of women upon polishing wheels of any kind.

FIG. 18. VIEW OF THE FIRST-FINISHING, OR SANDING, ROOM

The natural color of the brier is a dark reddish-brown, and like most woods, it requires the application of some kind of filler to put it into shape for polishing. This is done by immersing the pipes in vats of liquid stain and filler, after which they are placed in the draining barrel, which may be seen at the right in Fig. 20. After the pipes are thoroughly drained the contents of the barrel are dumped into trays, from which the pipe bowls are spread on cloths on the floor for drying. They are then taken to the inspection and filling tables shown at the left of Fig. 20. From here they go to the finishing and polishing room where the surplus filler is removed with cloth buffing wheels; then the polishers, with similar wheels and a light dip of shellac, "burn," as they term it, a high grade of finish over the entire outer surface of the pipe bowl. The bowls are now ready for the assembling room. In another department of the tac-

tory is made that portion of the stem called the mouthpiece, or "bit." These mouthpieces are made from three kinds of material—rubber, Bakelite, and amber. The last-mentioned is now so rare and costly that it is only used on the highest grade of pipes, most of which are of block meerschaum. The well-known clear amber-colored stems used in most pipes are made of Bakelite. These parts are received from the producer of this material molded to about the shape of the mouthpiece, but considerable finishing is still necessary to bring them into shape. One of these operations is performed on the machine shown in Fig. 21. This machine grinds off the surplus material, after which the bit passes through several polishing operations. The stems are then drilled, and the end next to the bowl is countersunk and threaded to take the small bone connector by which the mouthpiece is attached to the bowl. This is done before the final polishing, which latter operations are performed on felt buffing wheels with pumice and finished on high-speed polishing wheels. Another department makes the silver and gold bands which surround the joint between the brier and the mouthpiece, and also the metal caps that sometimes surmount the top of the bowl. A general view of this shop is shown in Fig. 22. These metal bands do not appear on all of the pipes, but on those where they are placed the brier stem is somewhat reduced in size at the point where the band is placed to take care of the additional thickness, as has been previously described.

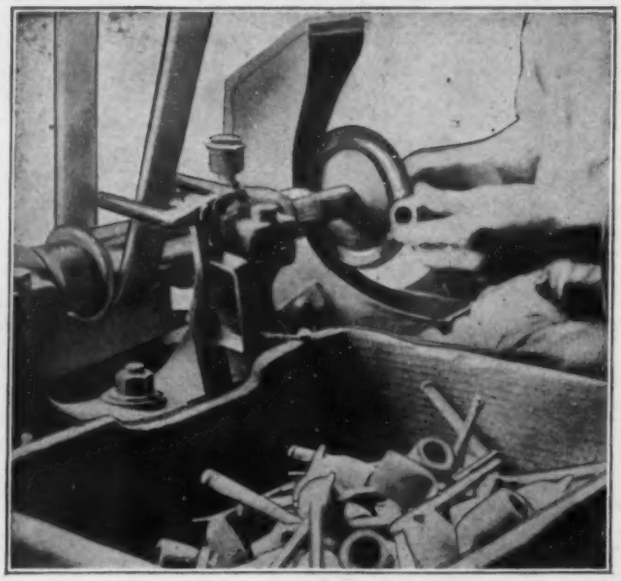
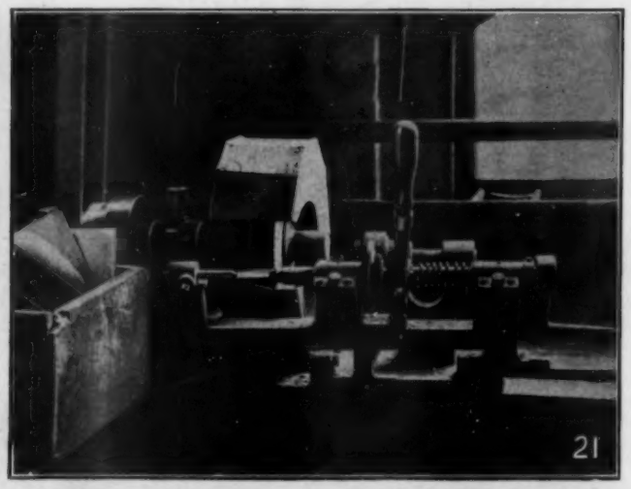


FIG. 19. SAND WHEEL FOR FINISHING PIPES

With the metal band in place the pipes are ready for



FIGS. 20 TO 23. OPERATIONS ON VARIOUS PARTS OF PIPES

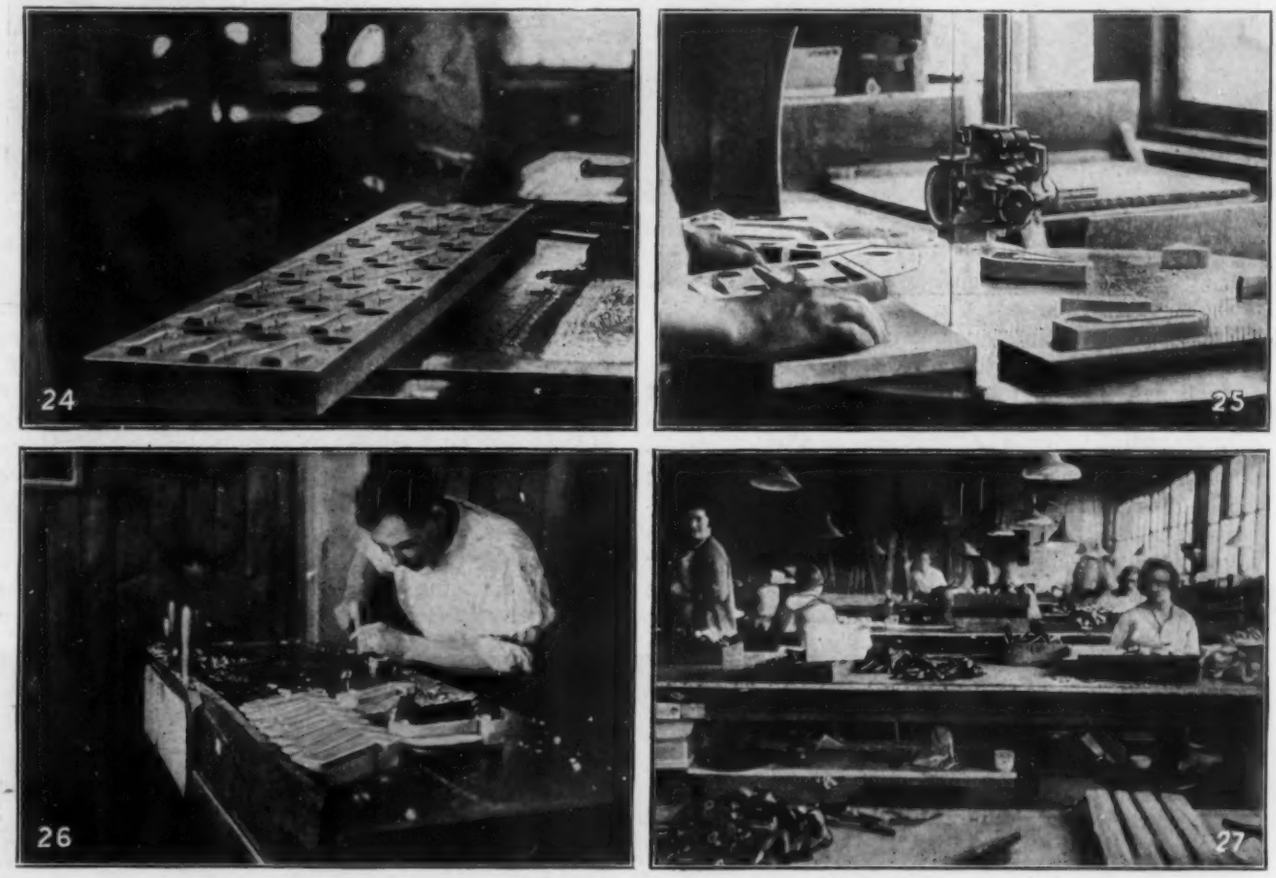
Fig. 20—Filling and inspecting the brier bowls. Fig. 21—Machine for grinding Bakelite stems. Fig. 22—Metal-working department for ornamental metal bands. Fig. 23—First operation in carving pipe cases

assembling. In connection with the square shanks and Bakelite mouthpieces there is an interesting operation which probably can be improved upon. As was mentioned when describing the work on these mouthpieces there is a small connecting section of bone or similar material. This has a fine thread on the end which enters the mouthpiece and is screwed in with a little cement to insure its setting tightly in place. The other end is provided with a special square thread to enter the brier. This permits the smoker to take it apart at this point to clean it without great wear or breakage of the wood thread. Since these threads are so coarse a slight turn backward will leave the stem loose, or if tightened too hard the mouthpiece will get out of line with the bowl and spoil the appearance of the pipe.

The coarse square thread in that part of the stem which is integral with the bowl is cut by a small bench machine built like a nut-tapping machine except that the tap runs forward and back automatically without waiting for the reversal of pressure by the operator. A guide is provided which consists of a vertical metal plate through which the tap protrudes. At the instant the tap is withdrawn from this hole the operator places the square end of a pipe stem against the guide plate, and when the tap again advances, the thread is cut.

The operator now tests this thread with a master gage, which may be considered as a steel pipe stem, and if the adjoining squares on both bowl and gage line up, the tapping is finished; but if the gage should "stand off," that is, if the sides of the gage and the stem should not match, a small amount of material must be removed from the wood and the tap allowed to run in again to make the thread the proper depth, after which it is again tested and if necessary the operation repeated until it is right.

The operator is remarkably adept in gaging this operation, but even so it requires time, and doubtless a more automatic solution of the problem will eventually be suggested. After assembling, the pipe is subjected to a further polishing operation before going to the stock and inspection rooms. From the stockroom the higher grade pipes are sent as required to the room in which the pocket cases are made.



FIGS. 24 TO 27. MAKING THE PIPE CASES

Fig. 24—A board of cases ready for band-sawing. Fig. 25—Separating the cases with the band-saw. Fig. 26—Carving the other half of a case. Fig. 27—View in case-finishing department

An individual case is made for every pipe, and both case and pipe are given a corresponding number to identify them as they pass through this department. The reason for making a special case for each pipe and giving both pipe and case the same number is that slight variations occur in the size and length of the finished pipes. It is believed that the methods used are far from being efficient, but they are the best at hand and must be retained until better methods or materials can be suggested. Each case is essentially hand made, and the material is of selected white pine, which is the lightest, strongest and best wood yet found for this purpose.

At the start, white-pine boards are planed to a true surface on both sides. They are about 1 in. thick and

12 in. wide, and are made up in pairs which may run from 2 to 6 ft. long. On one board of each pair an assortment of pipes, each numbered, is laid out, and a pencil outline made of each. This board then goes to the woodworker, who with the necessary carving chisels quickly recesses each outline until the correspondingly numbered pipe will fit into it exactly for one-half of its thickness. An operator engaged in this work is shown in Fig. 23.

The operation completed on all outlines, he then places the mating board beneath the recessed one and drives a small nail in each recess so that a completed board appears as shown in Fig. 24. These two boards are then taken to the band-sawyer who, with the open recesses in the top board to guide him, cuts the boards into sections, leaving a wall about ⅛ in. or less in thickness around the outside of each recess. Each section so cut out has the upper and lower pieces held together by the nail, which keeps them from being mixed, as they have now become individual pairs, and the piece of the lower board will constitute the other half of the case. The band-sawing operation is shown in Fig. 25.

These parts are now returned to the carver, who cuts the other section of the case to close over the pipe. This operation is shown in Fig. 26. The outside is then made to conform in shape to the inner recess, leaving the same thickness of wall throughout as nearly as possible, the stock being removed by the carver. A sand wheel is used to take out all chisel marks and smooth up the whole surface. Attempts have been made to make these cases on the frazing machines used for pipe forming, but it was found that these machines will not work on soft wood. When other and harder woods are used, the product is heavier, and is also much more likely to split when the tiny nails are driven that hold the hinges and clasp. Consequently to make this a machine job, cutters which would be suitable for soft pine must be used or some substitute for the white pine.

FIGS. 28 AND 29. FINISHING OPERATIONS ON THE CASES

After the sanding operation the cases go to the room shown in Fig. 27, where the first operation is to fit them with hinges and clasps. A number of cases which have just been fitted up in this manner are shown in Fig. 28. From this point forward there are many other operations, such as fitting the velvet lining and gluing on the paper filler strip and the leather covering. Some idea of this work may be gained from Fig. 29, where the velvet lining is being placed on the inside of some of the cases and other cases with the paper filler strips are shown in the background.

Because of the value of the material and that no power-driven machinery is employed, the meerschaum department is to some extent isolated from the rest of the plant. The pipes are all carved with hand tools from solid blocks of meerschaum, the only thing in the department resembling a piece of machinery being the foot lathe, built mostly of wood, which may be seen in Fig. 30. With this lathe the carver bores out the meerschaum block to form the bowl and turns the latter to shape. As part of the stem is integral with the pipe it is obvious that only the upper part of the bowl can be turned continuously. When the turning tool reaches the point of interference with the stem the operator trans-

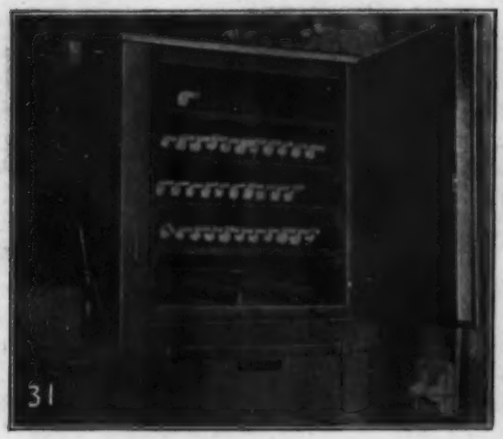


Fig. 31. DRYING OVEN

FIG. 32. BULLETIN BOARD SHOWING DIVIDEND RATE TO BE PAID

fers his foot from the treadle to a position between the spokes of the large driving wheel and from this point gives the lathe spindle a rocking or forward-and-backward movement which enables him to complete the turning of the bowl.

This rocking motion requires a superlative degree of skill, being performed with astonishing rapidity, the movement always stopping at exactly the right place, as a fraction of a turn too far would result in knocking off the stems and spoiling a block of material worth several dollars. From this point forward the pipe is shaped entirely by hand operations, the partly finished pipes being held in suitably shaped blocks on the carver's bench.

The meerschaum blocks are thoroughly soaked in water before work on them is started. This softens the material so that it pares with a knife or turning tool much like soft chalk. During the operations the block

FIG. 30. TURNING A MEERSCHAUM-PIPE BOWL

is frequently dipped in water to prevent it from becoming surface dry.

From the carver the pipes go to the finishing room, where the surface is smoothed by means of dried stems of reeds which are occasionally wetted with water. These reed stems have been found superior for this purpose to any abrasive paper that can be used. The final polishing of the meerschaum is done by hand with a soft cloth after the pipe bowls have been carefully dried in the steam-heated oven shown in Fig. 31 and dipped in boiling wax. These pipes are usually fitted with genuine amber stems.

The meerschaum chips have a value of their own and are carefully preserved. They are ground to a fine powder, dampened with water and subjected to heavy pressure which forms them into blocks having greater density and weight than a block of meerschaum of equal volume. This material is called "Baltic" and is used for producing a cheaper grade of pipe.

Blackboards are used throughout the shop to announce any matters of interest to the employees. A blackboard of this kind may be seen in Fig. 32 which makes an announcement that was of rather pertinent interest several weeks ago. The 16 per cent. in the lower corner of the board represents the amount of dividends which every employee of the plant will receive in addition to his wages for the two weeks' period current when this picture was taken.

What Is "Labor Turnover"?

BY ENTROPY

A great deal is said and written about labor turnover as if it were some generally accepted thing on which everyone was agreed, but when we get together and try to define it or write a formula by which to compute it we never by any chance agree within four rows of apple trees. The name "turnover" was probably borrowed from the retail store where it is possible to sell or "turn over" the equivalent of all the goods in stock four or five times a year.

Roughly speaking we may on the average change help completely four or five times a year. If we accept that statement, then the way to compute turnover is to take the total number of names on the payroll during the year, or in other words the total registration, and divide it by the average number of men on the payroll at any one time.

Then up bobs someone and says that his payroll always has about 50 per cent. more names on it than there are men working on any one day. The rest of the men are probably working for someone else, or at least are on someone else's payroll.

DIFFERENCE OF OPINION

There is unlimited difference of opinion as to how to find out how many employees a concern has. Where a few hundred people are out every day and a few hundred more are known to terminate their services each day there is always doubt as to whether John Jones, who is No. 5476 on your payroll, is really working for you or whether he is working for the Get-up & Get Construction Co. down the street.

There is also the possibility that he may be uncertain himself. He may be down there trying them out, and he may have intentions of coming back to you with a tale about a lame back or some other equally elusive story. The only man you know about is the man who is at work, or who at least rings in his time. Why worry about the rest of them?

Then the computation of turnover becomes very simple. Just take the number of men who actually worked full time for a year, which you get by taking the total hours worked and dividing it by the number of hours workable for the year, and divide that by the average number of men working day by day.

That seems rather reasonable until you try it once and you find that it does not show anything that you care about. What you really want to know is not a percentage of labor turnover, but what it costs you to replace the men who leave you with men equally good. If you are running a machine shop, a foundry, a pattern shop or any business where other people are training men who are as valuable to you as those you train yourself, then it may be possible for you to fire all the bum mechanics you have brought up and replace them with first-class men brought up in your competitors' shops, and your turnover will be a profit instead of a loss, and you will pray for more turnover.

If, on the other hand, as usually happens, and especially in these times, you take on a hopelessly incapable man every time you lose a good one, and have to train him at a considerable expense, then there is a tangible

loss. If you lose this man before he has become worth his salt and have to start all over with a more hopeless case, then you have an added expense, which you must saddle on to your customer in order to break even.

On the other hand if you could keep your men and your competitors could not, then they would have to raise their prices, in which you would of course follow suit in order to keep them out of bankruptcy, and you could put what they pay for breaking in new men into your own pocket as insurance against the time when they woke up and began to take a sane view of the matter themselves.

Comparing the Records

But to get back to labor turnover: We really want some index by which we can compare our records with those of last week and the corresponding week of last year and also with those made by our friends in the same and other businesses. For example, if we were to find that our own labor turnover was increasing while that of a competitor was decreasing we would expect to look into it and find out why. If ours was on the increase when some other business into which our semi-skilled men could go was decreasing we would suspect where the men were going.

In other words, if we give up the idea for the time being of getting positive costs on our labor turnover and try to get something on which to base comparisons, then our task becomes simple. All we have to do is to get everyone to agree on something [Did you ever try it, Entropy?—Ed.], no matter what, so long as there is a numerator which represents change of personnel and a denominator which indicates average conditions.

It really makes very little difference for this purpose what the numerator consists of if only we all agree on it. It may be net hirings or virtual replacements; it may mean gross leavings, or leavings less allowance for death, marriage and other acts of Providence. It may allow for men leaving that we would like to get back, and omit from consideration men who are only on trial and not to be considered as hired until they have worked three or four months.

Any one of these schemes is justifiable and will permit of an hour's oratory in substantiation. The important thing is to get something that all can agree upon, and that will have to be something that no unscrupulous employment manager can twist in such manner as to figure his own turnover to his own advantage.

Such a rule was agreed on at the last convention of the National Association of Employment Managers at Rochester. It is admirably simple. It defines labor turnover as the percentage of total leavings to the average number of employees actually working from day to day. As a basis of comparison it is excellent if everyone will work by it. As a basis of actual conditions in the plant it means nothing. A turnover of 200 per cent. in one plant may not be as expensive as a turnover of 50 per cent. in another or even in the same plant at another time. As an index of the trend of things, it is good.

It still leaves us with our largest problem, which is some system of accurate cost accounting by which we can put a new man's actual earnings for a period of training against the average earnings of a number of trained men during that time and on the same work.

The difference between actual earnings and the bogie should be a changing difference decreasing from day to day as the new man becomes more and more proficient. This may be determined in the case of repetitive work paid by the piece if a record is kept of the work done before piecework is undertaken, and provided we are certain that the green men are given the same distribution of work as the older ones. If there is some poorly paid work which is ordinarily handed to new men, because the older men will not stand for it, allowance should be made for it, otherwise it would make the cost of turnover altogether too large.

The Genesis of American Gunmaking

By R. A. Trefethen

Ordnance officers and manufacturers of heavy guns may see a document, which to Americans is of great historical value and of especial interest at the present moment, carefully preserved in the Roger Morris house, or the Jumel Mansion as it is more commonly termed, on Washington Heights, New York. This paper, dated June 15, 1776—almost a year after the battle of Bunker Hill and three weeks before the signing of the Declaration of Independence—is an order by the Committee on Safety of the American Revolutionists to W. Joshua Tomlinson for £100 in payment "for making public his knowledge of grinding and boring of gun barrels."

This was information of tremendous value to those engaged in manufacturing guns for the Continental army and the few vessels we managed to equip for active sea service, and £100 (less than $500 in our present currency) was a heavy drain on the slender funds at the command of the American Congress. In 1776 Liberty loans were not being heavily oversubscribed. At that time the enemy's fleets controlled the seas and we had no friendly ally to supply the sorely needed guns; our manufacture of war materials was confined to making powder and bullets for muskets, and machine tools were few and extremely primitive compared with our wonderful facilities of today. The Continentals were thrown on their resources to produce artillery, but thanks to "the spirit of 1776" and the skill of Tomlinson we were able to build our own guns.

The Committee of Safety

Pay to W. Joshua Tomlinson or order One hundred Pounds, being a premium allowed him for making public his knowledge of Grinding and boring of Gun barrels.

15th June 1776
Geo. Clymer Chairman

To John Nixon Esq. & others
the Committee of Acc'ts.

Mr. Rogers
pay the above Acc't out of the Monies belonging to Congress.

John Nixon.

Indicating Fixtures for the Gaging of Automobile Parts

By ALBERT A. DOWD

The close limits demanded in the quantity production of interchangeable parts by modern manufacturing methods, together with the inconvenient shape and size of many such parts, necessitate the use of specially designed gaging tools. This article describes several such gages as applied to automobile parts.

INTERCHANGEABILITY of parts used in automobile construction depends on the tool equipment and the methods used in gaging the finished work. Many minor parts of an automobile may be passed by the inspector with a fairly wide tolerance, but some of the more important pieces must be held to very close limits. During the process of the work, and between the various operations, the usual types of limit gages are used to determine whether or not the work has been made with sufficient accuracy. For the final inspection, however, some of the important parts are very thoroughly tested to insure that their sizes are correct and that they have not been distorted during the machining processes.

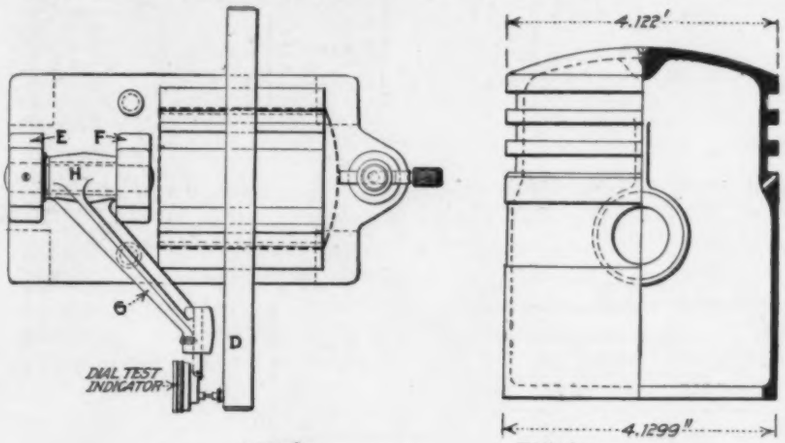


FIG. 1

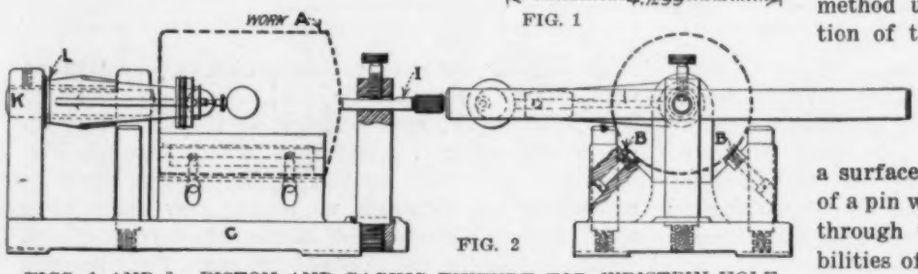


FIG. 2

FIGS. 1 AND 2. PISTON AND GAGING FIXTURE FOR WRISTPIN HOLE

Among the parts requiring very careful inspection are the piston, connecting-rod, camshaft and crankshaft, and some of the fixtures used in testing these parts are illustrated and described in detail in this article.

Referring to Fig. 1 an automobile piston is shown. It will be seen that the piston is tapered from the closed end to the open end approximately 0.008 in. on the diameter. This taper is provided so as to allow for the expansion of the metal in the piston caused by the heat of the explosion when under working conditions. In gaging a piston of this kind there are several points that are of vital importance, as follows: The width of the piston-ring grooves; the diameter of the piston at top and bottom; the diameter of the wristpin hole; the distance from the center of the wristpin hole to the top of the piston, and the relation of the wristpin hole to the center line of the piston.

The width of the piston-ring grooves is easily determined by blocks of suitable size, and the diameter of the piston at top and bottom can be ascertained by the use of the dial test indicator mounted above the inspection table and set to size by Johansson gages or other method. The diameter of the wristpin hole can be determined by the use of a limit plug gage. The distance from the center of the wristpin hole to the top of the piston can be determined by a simple process of measurement from a plug inserted in the wristpin hole to the top of the piston. It is very important that the wristpin hole be at right angle to the center line of the piston, because if it is out of true in this respect the piston, when assembled in the motor, may "drag" along the inside of the cylinder walls and cause excessive friction or overheating. The ordinary method used for determining the relation of the wristpin hole to the center line of the piston is to set the piston on the open end on a surface plate and make a comparative test with a surface-gage dial indicator of the ends of a pin which has previously been passed through the wristpin hole. The possibilities of an error in using this method are great, because chips or dirt under the open end of the piston when machining may easily have caused inaccuracies in the work. As it is the circumferential surface of the piston that must be in proper relation to the wristpin hole it is logical to determine the accuracy from this surface rather than from the open end of the piston.

An indicating gage which has been designed on this principle is shown in Fig. 2. In this case the work *A*, shown by the dotted lines, rests in a V formed by two hardened strips *B*, which are inserted in the base *C* of the fixture. These strips are set on a slight taper to correspond with the taper on the outside of the piston. A hardened and ground pin *D*, which is a close fit in the wristpin hole and which extends a considerable distance beyond the edge of the piston on each side, is used as a testing bar. The fixture base *C* has two lugs *E* and *F* between which a movable arm *G* swings. This arm is bushed at *H* and is very

carefully fitted so that it revolves on the pin *K* which acts as a bearing. A hardened thrust washer *L* is used between the lugs to take the wear. A dial test indicator is adjustably mounted in a boss at the end of the swinging arm *G*. The stop pin *I* is for the purpose of obtaining a longitudinal stop and thereby positioning the piston in the gage.

It can readily be seen that the dial test indicator button, when swung from one side of the pin *D* to the opposite side, should show the same reading. If the reading is different at these two points it is apparent that the wristpin hole is not square with the outside of the piston. There are a number of important points to be tested on an automobile connecting-rod, and by reason of the difficulties encountered in manufacturing this part it is always possible that some of the bearings or surfaces may be out of alignment. In the final inspection of the connecting-rod these points must be carefully looked after, and faults in machining must be corrected before the work passes out of the inspector's hands. One of the commonest errors found in testing connecting-rods is an absence of alignment between the bearings at opposite ends of the piece. To provide a testing fixture which will quickly determine inaccuracies in regard to the alignment the device shown in Fig. 3 was designed by the writer. The connecting-rod *A* is provided with test bars *B* and *C* at each end. *D* is provided with hardened studs *E* at one end on which the bar *B* rests. As the piece is placed in position on the fixture this bar *B* is forced against the two hardened pins *F* by means of the spring plungers *G*. At the same time the work is located sidewise by means of the finished surfaces *H* on the fixture. It will be observed that the connecting-rod is offset, and provision is made by the pin *I* so that the work can only be put in place correctly.

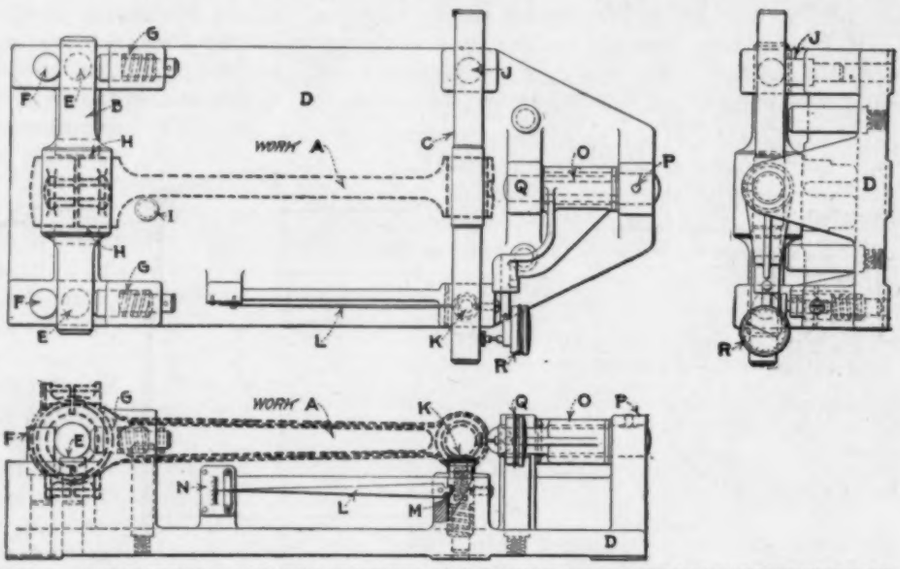


FIG. 3. INDICATING GAGE FOR TESTING ALIGNMENT OF HOLES IN CONNECTING-ROD

At the other end of the fixture one end of the bar *C* rests on a fixed stud *J* while the opposite end lies on an adjustable spring pin *K*. This spring pin is mounted in a boss which is slotted at one side and provided with an indicating pointer *L*. The short end of the pointer *M* is fitted to a slot in the spring pin so that any variation from perfect alignment is indicated on the scale *N*.

A swinging arm *O* is mounted on a shaft having bearings at *P* and *Q*, and is provided with the adjustably mounted dial test indicator *R*. This arm has an accurate bearing on the pin, so that the indicator can be swung from one side to the other to obtain a reading showing variations in alignment of the bar *C*. It can be seen that in testing the connecting-rod the alignment is quickly determined in both directions by means of the two indicators. If errors are found the rod can be bent in some approved manner and retested until found correct.

A fixture of this kind may be designed in such a way that the matter of straightening to compensate for errors can be taken care of without removing the work from the fixture; but the writer does not believe this to be good practice because pressure or force applied to a carefully made and more or less delicate indicating instrument is likely eventually to cause inaccuracies in the instrument itself.

In connection with the testing of an automobile camshaft there are several points that cannot be readily determined by the usual methods of inspection. Of course the shaft diameters and the spacing between shoulders can easily be gaged by ordinary methods, but the throw of the cams and their radial position in relation to each other, together with the shapes of the cams themselves and their relation to the keyway which locates the timing gear, are more difficult to determine unless a special fixture is made.

A fixture which was designed by the writer for an automobile camshaft having four cams is shown in Fig. 4, and it is evident that a similar design could be applied to any camshaft no matter how many cams were involved. The purpose of the fixture is to provide means for testing the shape of the cams, their position in regard to each other and to the keyway *A* at the tapered end of the shaft, and the throw of the cams, the tolerance of which is specified as ± 0.002. The base of the fixture *B* is a heavily ribbed surface plate which is scraped to a plane surface to permit the use of a surface gage. On this plate the three bearing blocks *C* are located by means of a tongue in a slot running longitudinally along the plate. The middle one of these blocks is of suitable width to fit closely the middle bearing of the camshaft, thus forming a positive location for the shaft in a longitudinal direction. It will be noticed that the center block is wider than the other two blocks and that the bosses on each side of it are finished to provide a fit lengthwise of the bearing. Each of these three bearing blocks is provided with a swinging latch *D* and a handle *E* by means of which the latch can be quickly lifted out of the way. A pointed, spring-actuated pin *G* acts as a detent to hold the latch in position. Over the center

of each bearing a spring button *H* is provided, which bears on the camshaft with sufficient pressure to keep the latter in place while being tested.

At the left of the fixture, as shown in the illustration, is a locating and indexing mechanism mounted in the block *I*, which latter is bolted firmly to the base and apart, and by means of the index pin *O* these bushings are located successively to test the position of the cams.

In testing the cams for throw a special surface gage *P* resting on three hardened pins *Q* is used. This surface gage is designed to slide along the surface plate

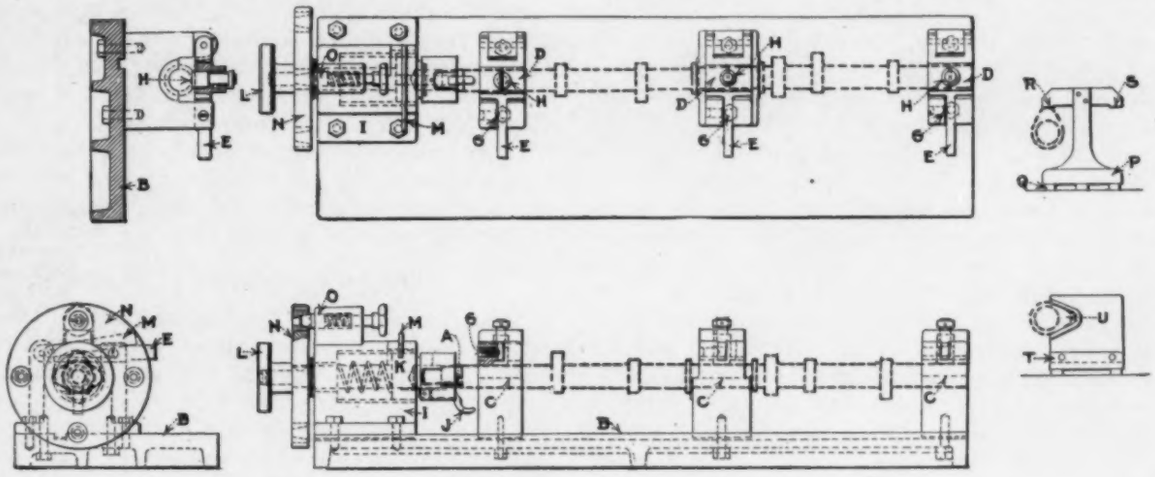


FIG. 4. INDICATING GAGE FOR CAMSHAFT

is also located by means of a tongue in the longitudinal slot. As it is important that the cams should occupy certain positions with reference to the keyway *A* which locates the timing gear it is evident that this keyway is the proper point of departure in testing the cam positions. To locate the keyway in the fixture a swinging key having a finger lever *J* is mounted in

and is provided with finished pads *R* and *S* which differ in height by the amount of tolerance permitted in the throw of the cams. By moving this gage from one cam to the other it is easy to determine whether or not they are within the required limits. The form of the cam is ascertained by means of the templet gage *T*. The form of the templet conforms to the shape of the cam, as indicated at *U*, and variations in the contour can be easily determined by comparison. The bearings of an automobile crankshaft can be readily inspected by means of micrometers, and other points of importance in connection with the crankshaft can be tested with ordinary types of measuring instruments, surface gages, dial indicators, etc. The spacing of the crankshaft bearings and the crankpins is a matter of greater difficulty, and therefore a special gage that will measure the tolerances permissible is of prime importance. Owing to the fact that a crankshaft is long and would require a gage to show the spacing of the crankpins and bearings, which might be somewhat cumbersome, the middle bearing is taken as a point of departure and all measurements are determined with reference to this bearing.

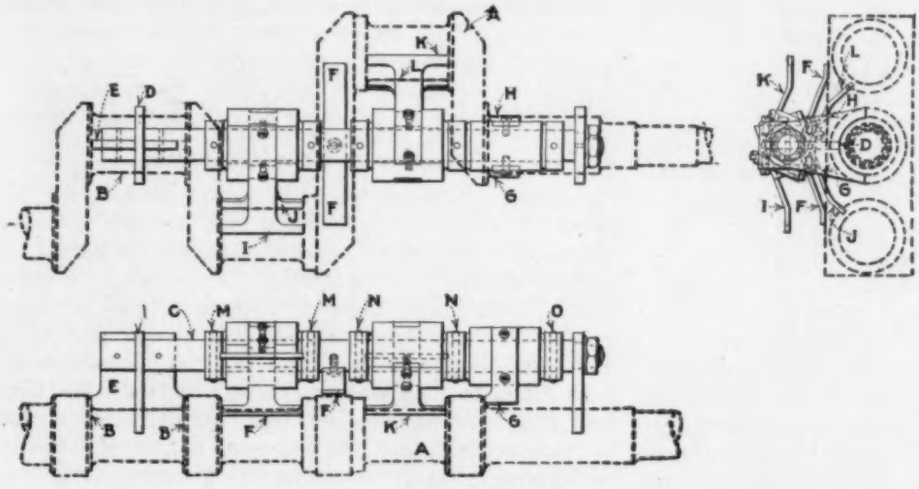


FIG. 5. CRANKSHAFT LIMIT GAGE

a slot in the sliding sleeve *K*. The edges of the key are tapered slightly so that there will be no lost motion at this point. The coil spring shown forces the sleeve *K* on to the tapered end of the shaft, thus making, in connection with the key, a positive contact with the work. In placing the work in position the sleeve is pulled back by means of the knurled knob *L* until the latch *M* drops down into the groove shown on the sleeve, thus holding it back out of the way.

In order to determine the location of the cams in relation to each other and to the keyway the index plate *N* is keyed to the shaft which carries the sleeve. This index plate has four tapered bushings 90 deg.

That the work may be suitably inspected during the process of machining it is advisable to make the gage in such form that it can be applied while the work is in position in the various machines. A gage which meets these requirements is shown in Fig. 5. A portion of the crankshaft which is to be gaged is indicated by the dotted lines at *A*. Assuming that the middle bear-

ing *B* has been machined within the permissible tolerances, it is taken as a working point from which to gage the pins and bearings on each side of it. The gage consists of a hardened and ground bar *C*, having at the left end a fork *D*, the semicircular form of which fits the bearing, and a templet *E* which is a close fit between the shoulders *B*. The right end of the gage has a similar fork which fits the bearing at this end, properly aligning the bar. In order to keep the gage from tipping over when in use a strip of metal *F* is suitably mounted under the shaft so that it will rest on the cheeks of the crankshaft.

The spacing of the end bearing farthest away from the middle bearing is determined by swinging the limit plates at *G* and *H*, these plates being arranged on the go and no-go principle, so that if the machining of the shoulder is not within the required limits the plates will show it. In like manner the two crankpins at the right of the middle bearing are tested by the plates *I* and *J* and *K* and *L*. It will be seen that these swinging plates are mounted on bearing blocks of rectangular form which are carefully fitted to eliminate lost motion between the hardened collars *MM*, *NN* and *NO*.

After one end of the crankshaft has been gaged the gage is reversed and the bearings at the other end tested.

Turning Small Bosses for Use in Pattern Work

BY JOHN PARKER

On page 212, Vol. 48, I noticed a good way of turning down small bosses, both tight and loose, for pattern work. While approving the method described when applied to the end grain of wood and with no regard to the time expended in gluing the end grain to the faceplate, I know that in up-to-date shops the time taken to glue on the piece would have to be considered, and the short grain of wood in bosses obtained by this method would be objectionable because of a tendency to split and break in use.

A more practical way is to use a small wooden or metal faceplate which will be found in any shop (no special one is needed) and, while the faceplate is revolving, hold a small piece of a paste made of rosin, whiting and beeswax against it long enough to leave a coating. Have your bosses cut out in the rough with a hole the size of your wire in the center of each. Insert a piece of wire or nail in the hole, hold the boss against the revolving plate for a few revolutions and then let the piece spin with the plate; it will stick tight enough to stand any ordinary turning. To take off the finished boss insert the edge of a chisel or a knife between the boss and the plate and it will snap off very easily.

There is no limit, except the operator himself, to the speed at which these bosses can be turned, and the grain of the wood will be across instead of through them. No parting or cutting-off tool is needed; simply use a pair of dividers to determine the size and turn with chisel and round nose (for fillet) or small gouge.

To make the friction paste use 75 parts rosin, 10 parts beeswax and 15 parts whiting melted together, cooled and broken into pieces the size required.

The Wage Limit

BY ENTROPY

The official rate of pay for first-class machinists in shipyards is 72½c. an hour. If the usual custom is followed—that is, 11 hours' pay for 10 hours' work—the rate is about $8 a day, or about $2300 a year, which is probably quite a little above the average income of professional men throughout the country.

This may indicate that we are beginning to realize that a machinist is quite as important as a lawyer, a doctor or a minister, a feeling which we would more willingly entertain were it not for the fact that we believe some of the men who are drawing this amount of money are not strictly first class and that the rest of them do not care whether they are or not.

HOLDING PROFESSIONS IN ESTEEM

The principal reason for holding the professions in esteem, even though other occupations may yield greater returns, is that professional men are jealous of their good standing and frown upon those who are not ethically and professionally up to a standard which at least assures respectability.

Unfortunately the high wage rate of machinists has not been reached by means that correspond to those of the professions, but by taking advantage of the necessities of a country which many of them have adopted because it has given them protection and privileges which they could not get elsewhere.

We must have that bridge of ships. Not only we in America but all the civilized nations need it equally. To get it a few highly skilled and a great number of unskilled men must be recruited by the shipyards. These yards have not as yet been able to attract men except by the offer of money, exemption from the draft, and appeals to patriotism, and judging by the magnitude of the first inducement the other two do not count much.

CONDITIONS IN THE SHIPYARDS

Considering the conditions in the shipyards it is little wonder that men have hesitated to offer their services. The work has been unsheltered (though the advent of warmer weather has mitigated this condition to some extent). Men are, however, rushing to the yards in greater numbers than can be used to advantage, and it will soon dawn upon them that the "fat" jobs have all been taken by men who intend to stick until the next cold snap at least. The next best men will then be glad to take the next best jobs and some degree of stability will prevail. At present unthinking people, in an excess of zeal, are advertising that there is a scarcity of men in the shipyards, which as a matter of fact does not exist, the result being that nearly all yards (and the same is true of the better known munitions shops) have long waiting lists except in a few of the highly specialized trades.

If private concerns, instead of recognizing the need for ships and munitions, raise their wages in competition with the Government, then there is only one thing that the Government can do and that is to raise its bid, and as it is generally more possible for the Government do this than private firms it is more than foolish to bid against it, as it is only cutting one's nose to spite one's face.

V—Special Machinery

The large number of Comptometers made by the Felt & Tarrant Co. and the multiplicity of parts in each machine warrant the design and use of special machines and tools that could not be used economically if the number of parts did not mount into such high figures.

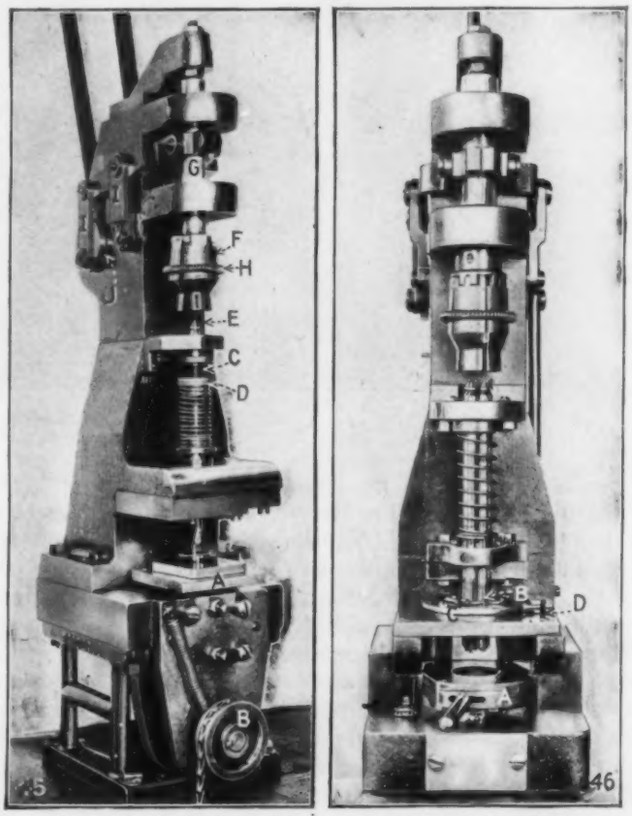
THE assembling of small parts that are held together by rivets requires the use of riveting machines that are capable of more delicate work than are most of the machines of standard construction. One of the single-spindle machines is shown in Fig. 45. In this type of riveter the anvil block *A* carries a jig for holding the work, and is raised to the spindle by a cam attached to the shaft of the pulley *B*, which in turn is operated by a chain and foot lever, thus leaving the operator's hands free to handle the work. A suitable adjustment permits the anvil to be raised to any desired height within the limits of the machine.

The spindle *C*, with the hammer at its lower end, carries an adjustable collar *D*, which controls the tension of the spring and consequently the force of the blow applied to the rivet. The upper end of this spindle is shaped as shown at *E*, affording a grip for the sectional chuck *F*, which is shown open at its highest position just as it has released the hammer spindle.

The spindle *G* is hollow, and receives an adjustable rod which is locked to the head of the machine by two locknuts, as shown. Its lower end engages the jaws of the chuck at the end of the up stroke and opens them, releasing the hammer spindle. The coil spring *H* in a groove in the chuck jaws holds them together so that they will grip the cone on the hammer spindle.

The spindle *G* is operated by the lever *I* through the medium of the crank disk and pin *J*.

The advantage of this type of riveting machine on small parts is evident. As the length of the hammer stroke is not fixed and the force of the blow is controlled by the compression of the spring it is almost impossible for the machine to damage any of the work.



FIGS. 45 AND 46. SPECIAL RIVETING MACHINE

Another riveting machine of similar construction, but having five spindles, is shown in Fig. 46. This machine was designed to rivet the 10 pins in the wheel shown at *A*, Fig. 47. These pieces come to the operator with

the pins inserted ready for riveting, and are placed in the jig *A*, Fig. 46, which holds them in position under the hammers. The jig is so constructed that when five pins have been riveted it can be swung round to bring the other five into position, thus heading all of the rivets without removing the piece from the jig.

The lower ends of the spindle at *B* are cut to form ratchets, which are engaged by pawls on the knurled ring *C*, which is fed around by the pawl *D* or by hand. This causes the spindles to rotate and put a good finish on the ends of the pins.

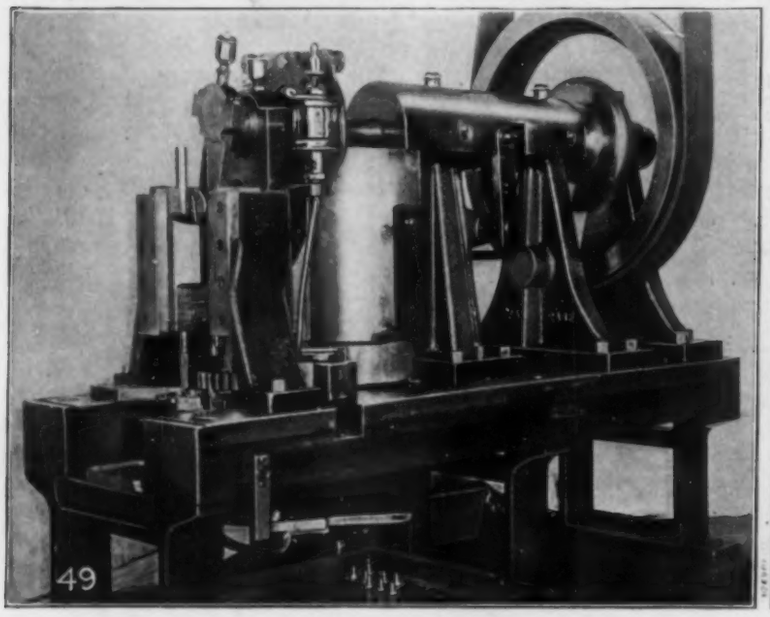
The piece shown in Fig. 47 is first made on the screw machine as at *A*. The hub *B* is then formed in the bench lathe and four holes in the central part of the piece, as at *C*, are drilled. The 10 pin holes are then drilled in a jig at one operation with the 10-spindle drilling machine shown in Fig. 48. As the 10 holes are so close together that they can be covered with a dime it can readily be seen that no ordinary type of multiple-spindle machine would handle the work. The space between adjacent spindles is only $\frac{1}{16}$ in., so that the thrust collars *A* have to be spaced alternately above and below the plates *B*. The lower ends of the drill spindles are drilled and split to take the drills, which are clamped by means of the threaded sleeves *C*.

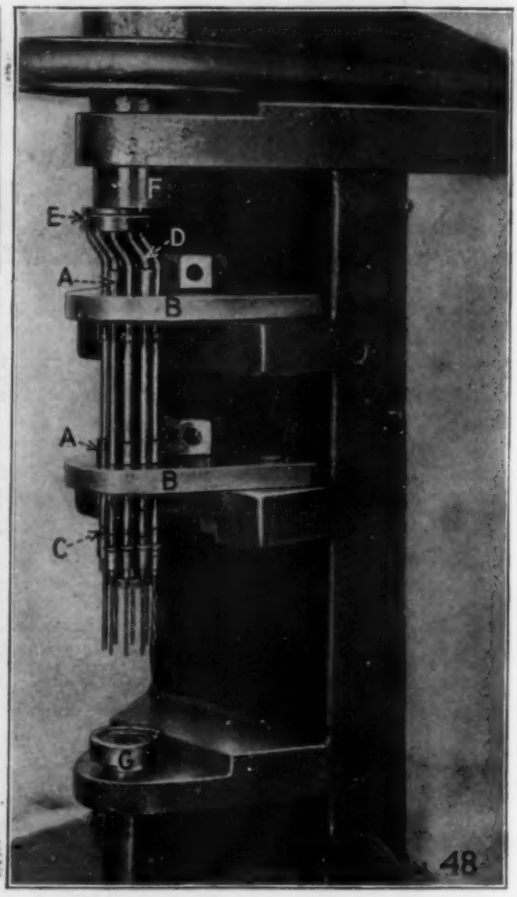
The upper ends of the spindles are bent, as shown at *D*, and clear each other in any position. The extreme ends are turned to size and true with the spindle shafts and are held in 10 holes in the collar *E*, which carries a stud on its upper portion. This stud enters a hole which is drilled eccentric with the center of the revolving spindle *F*, and imparts its motion to the spindles, which run at high speed.

The drill jig is placed on the plunger *G*, which is raised and lowered by the hand lever *H*. One's first impression would be that this drilling machine would not run smoothly and would cause lots of noise and vibration, but such is not the case, for the parts are so tight and well balanced that it runs smoothly.

The 10 wire pins are inserted in the holes and cut off by the machine shown in Fig. 49. There are so many parts and motions to this machine that a detailed description would require an article of considerable length, so a brief general description is all that will be given. The piece to be pinned is held in the jig shown at *A*, Fig. 50, and this in turn is located on the rotating index plate *B*, which carries 10 bushings corresponding with the 10 pin holes in the piece. This plate is indexed automatically by the intermittent gear *C*, and is held in position by the plunger *D* while the pin is driven. The wire is fed through the holes in the piece and cut off automatically, all 10 pins being placed before the index comes to the stop position as shown.

After assembling the frame plates on the frame bars, as shown at *A*, Fig. 51, it is necessary to line-ream numerous holes that carry the shafts for the working parts of the machines. The special machine was designed and built for this purpose, and with it 27 holes are reamed through in about the same time it would take a workman to ream one hole by hand.





FIGS. 47 TO 49. DRILLING AND PINNING OPERATIONS

Fig. 47—The accumulator wheel. Fig. 48—Machine for drilling the accumulator wheel. Fig. 49—Automatic machine for setting pins

The bed *B* of the machine is a substantial casting, with ways finished and gibbed for the carriage *C*, which carries two bushed guide plates *D* fixed at the forward end. These plates guide the reamers and support them while starting into the machine frames. The rear plate carries suitable locating devices for aligning the machine frames in correct position. On the rear of the carriage is mounted a movable angle plate *E* which slides in a slot cut in the carriage. This plate also carries locating devices for aligning the frames the same as the one in front.

The carriage is moved by the large handwheel *F* through the medium of rack and pinion. The box *G* carries the reamer heads, or chucks, and drives them through a train of gears, which in turn is driven by a pulley at each end, the belt passing under both pulleys and over the adjustable idler *H*.

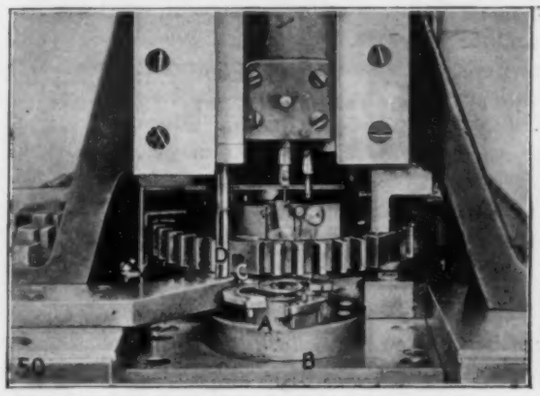


FIG. 50. SETTING THE PINS

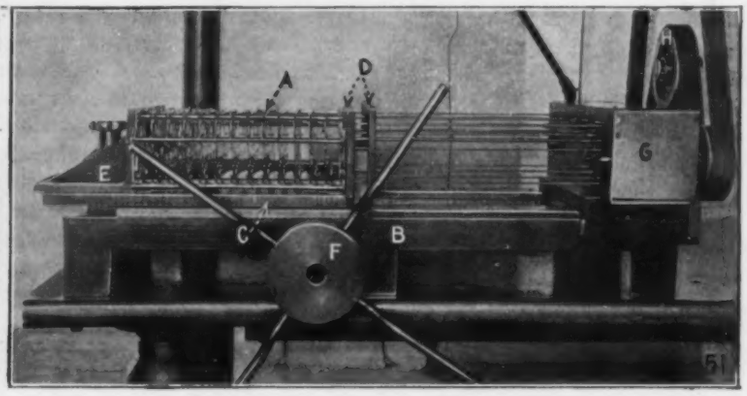


FIG. 51. MACHINE FOR LINE-REAMING THE FRAMES

The reamers are made from ground stock with teeth cut on the ends, the shanks being of the same size as the finished holes, so that as the reamers finish the holes in one plate and pass through to the next the holes already reamed support the reamer and act as a guide to the next plate, thus assuring perfect alignment of shaft holes in all plates.

Cutting Off Stock for Machine Work

By D. Baker

Some time ago I noticed an article on the subject of waste occasioned by the planning department ordering stock cut off to short lengths instead of working from a full length bar, which necessitated a chucking piece being left and thus wasted on each part. The contention that there is frequently a great deal of stock wasted in this way is quite true, but, on the other hand, suppose we had no shop order department or planning room and allowed each workman to make out his own requisition for stock, the possibilities for error would then be multiplied by the number of individual workmen involved.

A method which the writer found to work out with good results while acting as toolroom foreman, with from 50 to 75 toolmakers engaged on small and medium sized tool and gage work, was as follows: A form such as that shown by the diagram was provided, printed on a standard 6 in. x 8 in. filing card. The stock of steel was fully listed on these cards in accordance with its grade, such as tool steel or cold-rolled steel, and in accordance with its size. Spaces were also provided for noting the maximum and minimum stock allowances.

It was my custom to order all steel used on various jobs and have it cut up in advance of giving out the work. As fast as the requisitions for material were made out, by constantly consulting the cards they were turned over to the clerk, who checked off the amounts in the quantity columns of this stock record. Also, in order to save confusion, it was my practice to write out my requisition in such a way as to give the end size of the bar from which I expected the piece to be cut, the size corresponding to the heading of my inventory card. To make this clear, suppose we desired a piece of steel ⅜ x 1½ x 6 in.; this can be obtained in either one of three ways—it can be cut from a ½ x 1½ in. bar 6-in. long, or a 1½ x 6 in. bar ½ in. long, or a ½ x 6 in. bar 1½ in. long. By specifying on my requisition the size of the bar the supply man knew at once the size to look for, but had I permitted him to use his judgment in cutting he would probably have destroyed the value of my stock record.

PERPETUAL INVENTORY

MATERIAL C.R.S. ⅜×2 WEIGHT PER FT. 2.55 LB. MAX. 500 MIN. 150

QUANTITY	DATE	QUANTITY	DATE	QUANTITY	DATE	QUANTITY	DATE	QUANTITY	DATE

PERPETUAL INVENTORY CARD FOR TOOLROOM STEEL

As fast as the stock was cut off it was placed in sheet-metal pans, and in with it an order to the workman and a blueprint of the part to be produced. These were stored on suitable shelving near my desk, and it was a simple matter to keep the men supplied with work suitable to their skill.

This scheme of keeping small portable work in pans was a great advantage while we were running night and day shifts, as each shift was obliged to turn in their work daily, where it could be readily inspected by the day and night foremen as they relieved each other.

Demand for Machine Tools After the War

By LUDWIG W. SCHMIDT

Many countries, neutral and otherwise, have been compelled to enter numerous lines of industry hitherto neglected. New factories and new enterprises have been started to exploit the fields that have been opened, and are prepared to take prompt advantage of the opportunities.

BEFORE the war the principal field for American machine tools outside the United States and Canada was Europe. England, Germany and France were America's best markets. Comparatively little was sold to South America, Asia and Africa, and only in 1914 did Australia become a customer of some importance. In those days the bulk of the machine-tool equipment of the world outside our own country was supplied by England and Germany. There were several reasons for this, the one most often given being price. No doubt the price of a tool materially influences its sale. Agents who sell American machine tools, however, point out that it is hardly fair to compare an American machine tool with a European one as to price. To get at the facts of the price question it is essential first to inquire into the cause of the apparently higher price. It will then be found that as a rule the American article embodies certain advantages that are not found in a similar article of European make, which of course adds to the price of the former. Price, therefore, of itself cannot be responsible for the fact that Germany, for instance, in 1913, sold machine tools valued at more than $1,500,000 to South America against $570,000 sold by the United States.

Close Affiliation

The forces working against the American-made tool are stronger than that of price, and they existed before the war. Chief among these has been the close affiliation of most of the industries in the newer countries with those of Europe. Wherever English capital was employed in building a railroad, or in mining, or in manufacturing; wherever German engineers were working in factories, the tendency has been to favor the machine tool of England and Germany. This is not meant to reflect on the character of the men who had to order the machines. It is a simple statement of fact, and it is only natural that the engineer who has grown up with a certain firm should not wish to risk his reputation by experimenting with machinery that he does not know. The manufacturing methods introduced in these countries by European experts and by native experts who learned their trade in Europe were European; consequently these methods necessitated European machines, and even the native labor was trained according to European standards.

Now a change has come. The principal cause for the establishment of new industries has been the interruption of commercial relations between the most powerful industrial nations resulting from the war. This has made it necessary for all those markets which formerly were supplied from outside sources to provide for themselves. There is now hardly a country in the world which has not in some way been affected by this development, with the result that today we are confronted by a total rearrangement of the machinery market of the world. The great efforts that have been made in our country to supply our own industries and those of our allies with machines for the prosecution of the war have drawn our attention from the comparatively small orders which have come to us until now as the result of this reorientation of the world's industries. But there is plenty of evidence as to its existence, and as it progresses we shall feel more and more the direct influence on our machinery exports.

The American machine-tool maker who is interested in this development has a good opportunity to study it by watching the reports of the United States consuls and commerce experts in foreign countries who have frequently referred to the astonishing growth of new industries in many countries that a few years ago were almost entirely dependent on Europe for the goods which they now manufacture.

News of New Industries

Hardly a day passes that no news comes from South America that some new industry has been started. Who would have thought three years ago that in the autumn of 1917 Brazil would have become an important center of the snap-fastener industry? Yet today there is a big enterprise of this kind in operation in Sao Paulo, and the results are said to be so promising that it is possible South American concerns will soon be selling fasteners to Europe. Another example is the rapid growth of the boot and shoe making industry in many South American countries because of the interruption of the exportation of European shoe supplies. When the South American countries begin to make use of their raw materials for manufacturing purposes it will not take very long before their imports will show a great change, and the machine industry of the world will be the first to profit therefrom.

The same causes which help new industrial settlement in South America affect also its growth in South Africa. During the last three years a great number of industrial establishments were started all over South Africa, and there is no doubt that their number would be much larger if it had been easier for their owners to obtain the necessary machines. Of the greatest importance to the machine-tool exporter in this respect is the increase in the number of repair shops. Formerly South African machine users, especially the farmers who used imported agricultural machinery, had not much difficulty to get repairs done. Most of the big importers owned repair shops and a supply of reserve parts for repairs. Since the war the supply of spare parts has been exhausted and it has become necessary to make many of them in the country. This is done by local machine shops, and there is promise of a new industry which may do nothing else but repair work on a large scale. The machines needed for these shops are the same as those which are used in the local repair shops in this country in neighborhoods where there is a large agricultural population.

The situation is very much the same in Australia. A report on the electrical industry of New Zealand recently published by the United States Government shows clearly the increasing demand for electrical power caused by the many new industrial establishments recently opened. These establishments cannot prosper unless they can buy at least the more simple machines they require. Especially will repairs have to be done in local repair shops. Considerable industrial activity is apparent on the Australian continent, and more than any other of the British dominions Australia holds prospects for creating a great national industry. There are large national resources of metal and coal which can be tapped easily, and the out-of-the-way location of the country makes it more dependent on its own resources. Already it has been shown that the country will have to provide many of its own needs if its citizens are to obtain them at reasonable prices. After the war when shipping cannot be provided as easily as before, transportation will make expensive many articles hitherto bought in Europe. Hence the necessity to manufacture them in Australia. To do this the industrial possibilities will have to be developed on a large scale, which cannot be done without machinery and repair shops.

Promising Field for Machines

Another promising field for machines of all description is French North Africa. The French government lately has done much to encourage industrial development in Algeria and Tunis, and it appears that especially the first-named country has made considerable progress. Algeria buys today more machinery than ever before. The new machines as a rule are imported via Paris, and it seems that it will be always easier to trade with Algeria through French import houses in Algeria than by trading directly, say from New York. The French house can keep itself better informed about the needs of the market, and there is the natural feeling of the French manufacturer operating in Algeria to deal with one of his own country whom he knows than with a stranger even if he be an American.

But this development is not confined only to countries outside of Europe. The neutral countries in Europe probably have suffered as much by economic isolation as South America or South Africa. They also have been compelled to make good their loss of imports by the work of their home industries. As a result of this isolation many new industries have been started in Spain, Holland, Sweden and Norway. The latter country, it is reported, has made astonishing progress in the canning industry.

New Firms

During 1917 thirty-five firms started and 30 increased their capital. Norway today has no manufacturers making canning machinery of the kind used in the more advanced American canneries, and it is therefore likely that offers of such machines at present would find a ready response in that country. Of more importance for the machine-tool industry in this country, however, is the news of the building of a big steel mill in Norway. Norway so far has had no steel mill of its own. The new mill will be erected in the neighborhood of the ore beds. With plenty of steel at its disposal it is certain that the Norwegian machinery industry will grow faster than it has in former years, which doubtless will have a good effect on the sale of machine tools in that country.

So far Norway has followed a very sensible policy in handling the importation of foreign-made machinery that was likely to benefit its industries. Importers of wood-working machinery, for instance, may import these machines free of duty provided none of that kind are made in Norway. The procedure of getting the remission is very simple. The machine is imported in the usual way and the duty paid. Then a claim for remission of duty is made on a declaration that the machine is not manufactured in Norway. If the claim is granted the custom authorities return the money.

Smelting Swedish Iron Ore

Sweden and Denmark are practically in the same position as Norway. Before the war Sweden used to ship much iron ore to Stettin, Germany, where coal could be obtained cheap enough for smelting purposes. With the great progress made in electrical smelting it is now contemplated to smelt a larger percentage of the Swedish iron ore in Sweden. The prospects in this respect are very good, and Sweden having already now a fair-sized machinery industry may soon become a most important market for all kinds of machinery used in the working of iron. Probably German machine-tool makers may attempt to get a large part of the Swedish orders for machine tools. Whether they will succeed is not so much a question of the inclination of the Swedish manufacturer to buy German machine tools, but rather a question of being able to supply.

Conditions in Germany

Just now we know very little about manufacturing conditions in Germany. From reports coming to us before this country entered the war we saw that the machine-tool industry in Germany was very busy with war work, and it would be of value to us to know how present industrial conditions in the central powers will influence their relations to other markets, especially those now neutral, after the war. In this respect news coming from Austria-Hungary should be very interesting. In a report recently printed in an issue of "Commerce Reports" a good deal is said about the enormous activity in the munition and general-armaments industry which like in Germany has made necessary the mobilization of all the machine-tool reserves of the country. Germany most likely will have assisted her ally largely by exporting machine tools. There has been a reduction of all kinds of supplies for the industrial production for civilian needs, which has had a restrictive influence on all building work. No export business of importance, of course, has taken place. The price of all engineering work has increased. Machine-building concerns, therefore, will have made good profits, which should enable them to buy new machine equipment after the war. This equipment in Germany and Austria probably will come exclusively from German and Austrian sources. So Germany and her ally will be completely taken up with providing the new machine equipment for their industries and may find little time to manufacture for export. In a time, therefore, when it is expected that the world will be largely in need of new machinery it is not likely that any assistance can be expected from German

machine builders, who before the war exported machine tools to the extent of $20,000,000 during one year.

Consequently this deficit may have to be made up largely from the American surplus. The responsibility thrown in this way on the American machine-building industry is not a light one. It will be increased by the fact that provision must be made not only for the new industries but also the many which have ceased to operate as a result of the war and which will be set in motion again when peace has come.

Machine-tool exporters in this country have probably noticed that there has been an enormous increase in the demand for heavy tools during the war. On the other hand there has been a decline in the demand for tools used for the purpose of special industries. As a matter of national policy many industries in the countries at war have closed down. Their machine equipment and tools have been transferred to establishments where they could be utilized with greater advantage for the conduct of the war. Other machine-tool users who before the war were in the habit of buying regularly a certain number of tools every year have not been permitted to do so, in order to preserve the existing tools for industries where better use could be made of them. After the war the first will try to buy new equipment, the second will find that their present machines, which have been employed for a longer period than they should have been, will have to be replaced. Both, therefore, will be in the market; in fact it seems as if this buying movement had already set in.

From England comes the news that the Birmingham jewelers are beginning to buy new machinery. Very likely we shall soon find more reports of this character in "Commerce Reports." They only anticipate what some day is bound to happen all over the world, and the question is how far the machinery industry will be prepared for this buying movement when it sets in.

The United States machine-tool industry has been able to increase its export surplus from $16,000,000 during 1913 to $84,000,000 during 1917, turning over to the world nearly $200,000,000 worth of machine tools since the war began. So far it seems that the great demand for machine tools coming from our own market since America entered the war has not led to a decrease in manufacturing capacity of the American machine-tool building industry. It should not be difficult to deviate the production of machine tools from the heavy kind now specially demanded to the special-purpose tool most likely desired after the war, and to hold in readiness the machine equipment for the world's new industries.

Shaft Calculations Simplified

By John S. Carpenter

A few good people still figure shafts by the antiquated and uncertain method which employs a constant that may range from 50 to 125. When I say uncertain I mean that the users rarely know what shearing stress that constant is equivalent to. True, they have learned that a certain work requires a certain stiffness in a shaft, and by trial they have found a constant that will reproduce those same conditions in a similar problem in hand.

The principal stresses in shafts are usually bending and torsion, the last named being analogous to shearing, so far as results go. The bending stresses cause deflection and must be separately computed and resolved into an equivalent shearing moment before the shaft can be computed. Usually the bending stress must be so small that the deflection will be negligible, and therefore can be combined with the shearing stress so that the total resolved stress will not exceed a safe maximum.

For ordinary machinery, such as centrifugal pumps, Pelton wheels, Francis turbines and a great deal of other machinery where there is no stress reversal or shocks, the combined bending and shear stresses can be assumed at 4000 lb. per sq.in. It is just such shafts as the above named that are usually figured by the rule-of-thumb method.

I propose to show how simply the equivalent stress that any such constant implies can be found, and I hope that a knowledge of the method will tend to eliminate some of the rule-of-thumb design.

Let M be the equivalent twisting moment in inch-pounds;

P be the horsepower to be transmitted;

N be the number of revolutions per minute;

S be the combined stresses in lb. per sq.in.;

K be the constant;

d the shaft diameter in inches.

Now
$$M = 33{,}000 \times 12 \times \frac{P}{2\pi N} = \frac{63{,}000P}{N} \qquad (1)$$

$$d^3 = \frac{5.1M}{S} \qquad (2)$$

Substituting the value of M from (1) in (2), we get

$$d^3 = 5.1 \times \frac{63{,}000P}{SN} \qquad (3)$$

which reduces to

$$d^3 = \frac{321{,}000P}{SN} \qquad (4)$$

As soon as we insert the value of the stress S in equation (4) we have the familiar expression for the diameter in terms of the power and speed with a constant factor. For example, if a stress of 4000 lb. per sq.in. was decided on, the equation (4) would reduce to

$$d^3 = \frac{80P}{N}$$

So then K, the constant, may be found by simply dividing 321,000 by the allowable stress. Conversely the stress S may be found by dividing 321,000 by whatever the value of K may be.

A table of values of K and S follow for the usual range of these quantities:

K	S	K	S
30	10,700	80	4,012
40	8,025	90	3,570
50	6,420	100	3,210
60	5,350	110	2,920
70	4,585	120	2,675

In some cases that have come under my notice there was a glaring waste of material simply because of loose methods in design. Shafts are hard enough to get at present, especially in the larger sizes, without trying to make things worse by making them needlessly heavy. Most modern concerns design by stress and stiffness, thereby obtaining surer results.

SIDELIGHTS

EDITED BY E. C. PORTER

In England 4,538,000 women and girls are employed in classified trades under the jurisdiction of the British Board of Trade.

* * *

The state free labor exchange of Ohio during the year ended June 30, 1917, placed 108,693 men, of whom 54.8 per cent. were common laborers, 13.1 per cent. odd-job day workers, 2.6 per cent. farm workers and 4.8 per cent. skilled workers.

* * *

The United States Department of Labor has issued a statement that war industries having field forces for recruiting labor may be authorized to continue their use after Aug. 1 under regulations prescribed by the United States Employment Service.

* * *

Forty-four manufacturers whose domestic sales aggregate $100,000,000 have formed the Allied Industries Corporation to develop foreign trade. Agents representing this corporation will be sent to Cuba, Central and South America, Porto Rico, the Dominican Republic, the Philippines and the Straits Settlements to introduce their goods. Combination was effected under recently enacted Webb-Pomerene Act.

* * *

The attention of the War Industries Board has been called to the fact that certain manufacturers now on the preference list for steel supply are reselling steel that has been delivered to them as a result of Government priority assistance. In order to prevent abuses of this priority privilege the board has passed a resolution that if any such resales are made hereafter without the approval of J. Leonard Replogle, director of steel supply of the War Industries Board, the manufacturer who is responsible for those resales will be dropped from the preference list and will not receive further priority assistance.

* * *

Airplane mail was carried from Washington to New York July 10 in 2½ hours, including the stop at Philadelphia. The average rate of speed for the entire trip was over 90 miles an hour, and that between Philadelphia and New York was 108 miles an hour. Lieutenant Dodge left Washington at 11:28 a.m. with 211 lb. of mail, arriving in Philadelphia at 1 p.m., making the distance of 135 miles in 1 hour and 32 minutes. Lieutenant Miller left Philadelphia at 1:08 p.m. with 134 lb. of mail, arriving in New York (distance 90 miles) at 1:58 p.m. During the month of June the airplane mail service made the remarkable record of falling below 100 per cent. only six times. The increasing familiarity of the fliers with conditions attending the flights has resulted in a considerable shortening of the average time. The direction of the compass is compared with the chart every 10 minutes during the flight and at each of the larger towns on the route. In this way the route through the air has been accurately charted and conditions noted.

The War Trade Board announces in a new ruling that until further notice individual export licenses will not be required to send newspapers, magazines and other periodically issued printed matter, including advertising circulars, also books and other printed matter intended for the personal use of the consignee, by mail to foreign countries. A special export license covering all such exportation has been issued through the Post Office Department, and persons mailing parcels containing the printed matter as named need not apply for an individual export license. If the shipment is in conformity with the postal laws and regulations and the package bears on the wrapper, plainly marked, the license number and the names and addresses of the consignor and consignee, the package will be accepted for mailing by the post office.

* * *

The internal-revenue collections for the fiscal year ending June 30 last totaled $3,672,000,000. The collections for the preceding year were $800,000,000. This year's collections exceed by nearly $200,000,000 the estimates made when the war-revenue measures were passed by Congress last year. Four thousand persons were employed in the work and the total cost of the collection was only $12,000,000. The patriotism roused by the war contributed largely to the success of the work, and the taxpayers assisted and coöperated with the Government. A determined effort will be made to bring to book tax evaders in every part of the country. The Treasury already has evidence against a large number who have sought to evade taxes, and by checking up contracts and with other data the Government expects finally to discover and punish many tax evaders, as well as recover large amounts of revenue illegally withheld.

* * *

Secretary McAdoo has received the following cablegram from General Pershing: "All ranks of the American Expeditionary Forces appreciate deeply the generous measure the Government has taken to provide insurance for their families, in proof of which more than 90 per cent. of the men have taken out insurance. To wisely provision for their loved ones heartens our men and strengthens the bonds that unite the army and people in our strong determination to triumph in our most righteous cause." The Bureau of War-Risk Insurance up to June 28 has written $212,566,000,000 insurance, representing 2,570,455 applications. The average amount of insurance applied for is $8,387, and in some battalions and regiments, some in France and some here, every man has taken out insurance. In some units every man is insured for the maximum $10,000. One of the American generals says that this Government insurance is an element of victory. All Liberty-bond holders and all purchasers of War Savings stamps may feel that they had a part in this insurance—the most just and humane provision ever made by any nation for its fighting men.

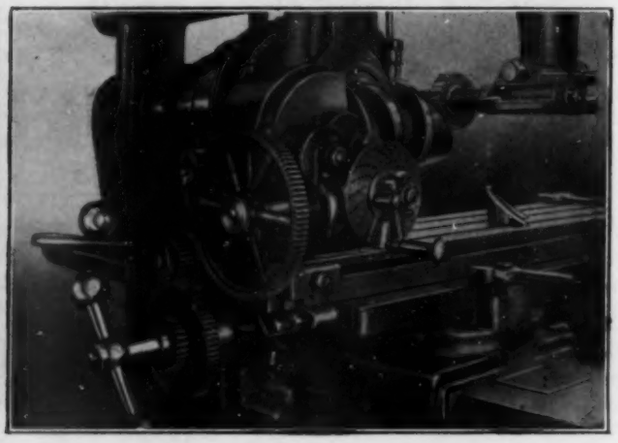
Assembling the Banner Knitting Machine

By ROBERT MAWSON

In this article is shown the manner of making the cams used to limber up the machines so they will operate smoothly. One of the machines with the cams attached is illustrated.

THE Hemphill Manufacturing Co., Pawtucket, R. I., which is the maker of the Banner knitting machine, employs an interesting process of enameling the machine parts. The first operation after the castings have been snagged is to dip them in the enamel and bake. This is the opposite procedure to that usually followed, since most firms perform the various machinery work on the castings first.

Care must be exercised in the shop to avoid marring the enamel while the work is passing through the various manufacturing stages, but this is offset by the quickness in which the enameling can be done. By this method removal of the paint from finished surfaces, threaded holes and the like is avoided.



FIGS. 1 AND 2. CUTTING THE CAMS

After a machine has been assembled the needle mechanism is operated so that it will work freely. This is known as "limbering up." In Fig. 1 is shown a milling machine set up for forming one of the limbering-up cams, the cam plate being held by an expanding chuck on the faceplate of the index head while one of the finished cams is shown on the table of the milling machine.

A view at the rear of the milling machine is shown in Fig. 2, where may be observed the train of gears used to obtain the lead of the cam desired, operating in combination with the travel of the machine table.

By referring to the table it will be seen that stops are provided so that the correct length of travel is obtained to suit the cam length being machined. Feed for the milling cutter is obtained by the indexing dial on the head in the usual manner, the same being revolved until the desired cam contour is obtained. It will be seen that one edge of the cam is machined as the table travels out and the other face as it returns; thus the finished part is obtained in one setting.

One of the knitting machines fitted up with two of these cams is shown in Fig. 3. It will be noticed that one of these cams is placed with the contour surface at the top and the other at the bottom. As the knitting machine is operated the needles are thus raised by one cam and depressed by the other. This causes the needles to work freely and removes any tendency to stick when the machine is finally operating in actual knitting.

Each machine is given this limbering up until it performs satisfactorily to the inspector in charge of the assembling department. The other elements of the machine are then assembled on the machine, which is then given a final rigid test on knitting stockings and if found satisfactory it is given the O.K. of the inspector. Any fine adjustments are made at this stage when found necessary until it will pass muster at the inspector's hands and receive his mark of approval.

Anyone who has read this article carefully will have observed the number of small parts used on a knitting machine. To obtain the desired output of completed machines these parts must be kept in such order and quantity that the factory is never kept waiting for any of them, as one missing part means delay in the shipment of a machine.

The perpetual-inventory system is employed at this shop. The number of castings received not machined and finish machined for any part is always known by the records.

A simple method of storing the castings and forgings is used. The parts are sorted and placed in barrels; attached to the barrel is a tag which shows the number of parts. As pieces are called for by the shop the number is changed, also the date when they were taken. A card index which must check with the tags is kept by the man in charge of the department, and by referring to this index the condition of the stock is apparent.

The final work is packing the machines for shipping. Two types of packing cases are used in the factory—one for foreign and the other for domestic shipment. In the former the machine is packed in waterproof

paper and is placed in the case, which is then securely fastened together, afterward having steel strips attached around the edges as a further safeguard against injury.

For domestic shipment a crate type of packing case is used. This type of packing case is cheaper to make and also easier to handle than the one used for foreign export. Another advantage is that owing to its open

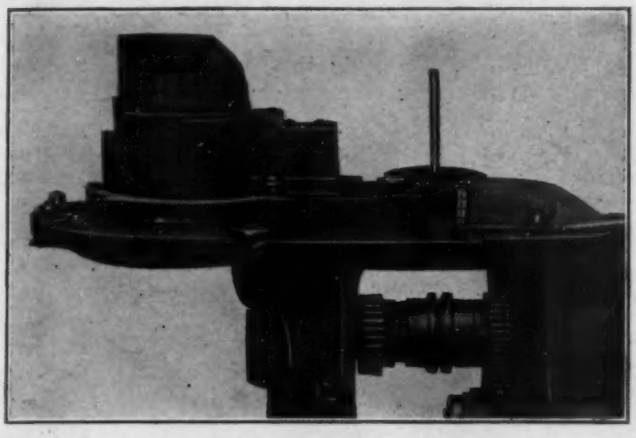


FIG. 2. THE LIMBERING PROCESS

construction its contents are apparent and the tendency is that the case will be placed so that the machine is in a vertical position, thus minimizing injuries to the mechanism. Another obvious advantage is the ease by which the machine can be removed from the packing case.

The Rebuilding of Belgium

BY E. DEBRUN

A Letter from the Director of the Board of Commercial and Industrial Education, and Belgian Officer for the Period of the War, Gaillon, Eure, France

In your letter of Mar. 19 you asked me to write to you on the subject of rebuilding in Belgium. Your most generous offer to help us in this huge task strengthens the good opinion I have of the American character, and it is from the depth of my heart that I express my gratitude for your spontaneous proposal.

In imparting to you my personal feelings toward your country I feel certain that I am also speaking for the Belgian people, who from the very beginning of this long and terrible war have daily known the compassion of your countrymen. The cries of distress coming from martyred Belgium have always found an echo in your hearts. Never have the Belgians called in vain. To bestow upon us material and moral comfort you shirk no sacrifices.

Moreover, in spite of the numerous sacrifices already accepted, in what you ask I foresee that this magnificent outburst of American generosity will not stop there, but will be manifested again in other spheres. What a fortunate thought, and what a comfort to us! Times are unkind, and you know better than we that a nation is not rebuilt with myths. You well know that our manufacturers are going to find themselves in their sacked and devastated country confronted with ramshackle mills and works; that they will be driven to give up a good many of their schemes and will be reduced to seeing their hopes vanish in the air. You have a clear idea that the giving up of all these schemes means the death of our manufactures, the migration of our brave working classes, the surrender of our country, and her decrepitude. The coöperation offered through the medium of your journal is most acceptable to us. Thanks to you, suffering Belgium will recover from her wounds, and in the not distant future we shall see her flourish again with renewed energy.

The Belgian government has paid much attention to the question of the economic revival of Belgium. The president of our Board of Trade has been so kind as to give me the following explanation and information: The task of the Minister of the Board of Trade is very complex. History offers few instances where a country as prosperous as Belgium has been so devastated. She has been the theater of military engagements for nearly four years, and behind the front line the Germans have made the most of her resources in a methodical way. All the raw materials kept in stock have been taken away; the machinery of our factories has been systematically taken to pieces and the most essential parts conveyed to Germany or destroyed. It is the mission of the Board of Trade to see that the ruins are speedily restored, and to assure the economic revival of the country.

So great has been the destruction that at first the disaster would seem irretrievable, but happily such is not the case. In spite of his efforts the enemy has been unable to exhaust the quick and ever-flowing sources of our country's prosperity. Situated in one of the most important quarters of the world, Belgium is a country whose population is characterized by its active mind, its great experience in industry and its untrammeled energy. At this moment, in spite of the occupation by the enemy, the Belgians are getting ready to restore their country's prosperity.

The creation of the Board of Trade is quite recent, dating from Oct. 12, 1917, but this does not imply that the work of restoring our trade had not been begun sooner. On the contrary scattered efforts had already been made, and to the Board of Trade has been intrusted the task of coördinating the efforts in accordance with a preconceived plan so that at the last turn of the war they may be invigorated and given fresh impetus. To such problems, so new in scope and complexity and involving the economic revival of a whole country, the work of the board is dedicated.

BOARD OF ECONOMY

Besides the heads of a central administration comprised of great men who have been through the mill, a Board of Economy has been created where the most eminent representatives of industry, commerce, finance and armament who are now away from their country may meet. The minister on the one hand directs his administration, while on the other he presides over the Board of Economy, and through this body comes in contact with the sources of the world's business. The central administration and the Board of Economy work closely together. The members of this board are scattered in foreign countries. Three important nuclei have been formed, one in Paris, one in London and one at The Hague. The Board of Economy is divided into committees, each of which studies the principal questions in its respective lines and retains the services of

professional men and technicists who can throw light upon the questions involved.

The task of the Minister of the Board of Trade presents four essential aspects—the industrial, the commercial, the financial and the restorative. Each of the committees keeps in touch with its particular office, which is part of the central administration. One duty of the administration is to maintain the link between the different offices. A paper on economical statistics is drawn, which regularly notes down the principal facts, knowledge of which is necessary for directing the political economy of Belgium.

The most urgent task of the Office of Industrial Operations is to assure a new stock of tools and a new supply of provisions both for commerce and industry. With this object in view this office has studied in close contact with the business world the creation of a central organization for the purchase of materials of all kinds. These studies have resulted in the establishment of a coöperative company called the National Counting House for the Revival of Economic Activity. The manner in which this company has been received by various interested parties gives us courage to believe that it will conserve the interests of all. It will serve as a medium of exchange through which may be procured the new stock of tools and the new implements of commerce and industry, either by state or private interests. This company will work under the control of the government.

Commercial Revival

The Office of Commercial Questions has principally to look after the commercial revival which must parallel or follow the industrial one. This commission collects and keeps up to date documentation which comprises important information concerning the amount of imports and exports and the conditions of production and competition between products of native and foreign fabrication. A similar documentation has been compiled by the Office of Commercial Questions comprising the data resulting from a thorough investigation of Belgian business conditions covering all available parts of the country. The sympathy which Belgium has gained all over the world gives her hope that commercial relations will be reëstablished with most of the states and thus assure her complete economic independence.

The task of the Office of Financial Questions is to inquire into all the financial questions relating to the economic revival of Belgium, such as the manner of financial reparation for war damages, advance money to those who are ruined and discount indemnities and new credits to assure new stocks of tools and supplies. It will also consider the questions of raising the Belgian rate of exchange, reëstablishment of the usual fiduciary situation, decrees for home credits, etc. Several propositions of great interest have already been made to the government so far as credits for new stocks of tools and a new supply of provisions are concerned. These propositions show that the foreign capitalists believe in the early reconstruction of Belgium.

The task of the Office of War Damages is to draw up statistics of war damages. A claims office has been created and uniform blanks will soon be circulated among Belgians who are not under German domination, which will enable them to state the amount of damage they have suffered. The same office is now finishing the study of a system of verifications and estimations of war damages requiring the creation of a special chamber of procedure in which all parties concerned may be heard. In short this office devotes itself to elaborating a scheme of restoration which is to be submitted to the legislative assembly as soon as the circumstances permit.

The question of organization of the factories is also a subject of study by the Belgian leaders, and our government has just sent a mission to the United States to study the industrial methods used in your country. I hope that the members of this mission will come back to us with a thorough understanding of their subject and that the seeds of knowledge that they have gone to gather will be speedily sown in a well-prepared soil.

As regards the intellect of our working classes our country is in a rather privileged position. Belgium possesses great resources of intelligence, a particularly adaptable turn of mind, and she is ready, as soon as peace is restored, for energetic efforts. We all understand the necessity for reforming our organization. Our men who stayed at home, those who have been exiled, and our gallant warriors and brave combatants, after having lived together in this awful ordeal, will be filled and animated with a spirit of coöperation. Devoted to the work, they will all be moved with the desire to see in the future a Belgium become great and powerful through the organization of a new life and a new order.

After the military battle the economic one will begin. Our powerful enemies will have kept their means of production nearly intact, and through the tremendous organization of her banks industrial Germany will revive more powerful and more redoubtable than ever. Does not the history of her economic prosperity indicate that, either vanquished or victor, she will be ready the day after war to reassert her commercial supremacy? By her improved stock of tools, her abundant stores of manufactured products, her business staff, she will want to be everywhere present when the time will have come for signing peace. It is for us to baffle her project.

The army needed by the Belgian nation for her economic revival has valiant soldiers, and it will have capable generals to direct it and to create the armament which will be necessary for victory. In this victory I believe. In order to realize this aim we again appeal to your generous feelings. Manufacturers of the United States, come to our help! Immortal Belgium shall perpetuate you in everlasting gratitude.

Tightening Worn Compass Joints

By Arnold Merritt

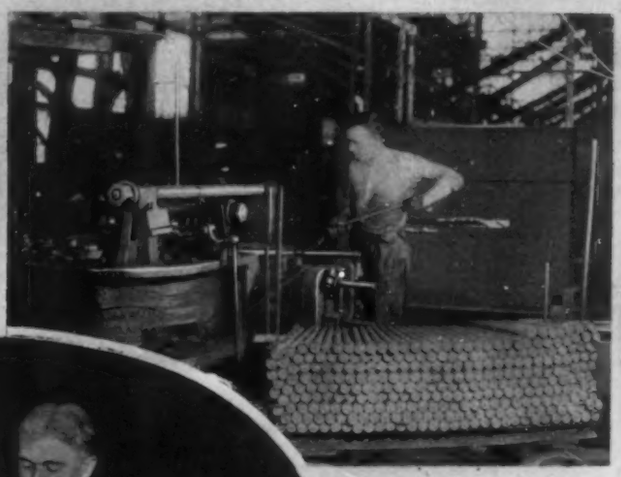
It is often necessary to tighten the joints in legs of compasses that have been used for some time, and the following is a little scheme I hit upon:

When it is impossible to tighten the screw any more, remove it and cut a hole in a piece of heavy drawing paper so that the screw will just fit tight; then with the paper on the screw turn the latter back into place in the compass leg. It will cut a washer which will be just thick enough to tighten the joint again.

Making the Browning Machine Gun

AT THE WINCHESTER PLANT

Forging barrels



Upsetting barrel butts

Mr. Browning – at left

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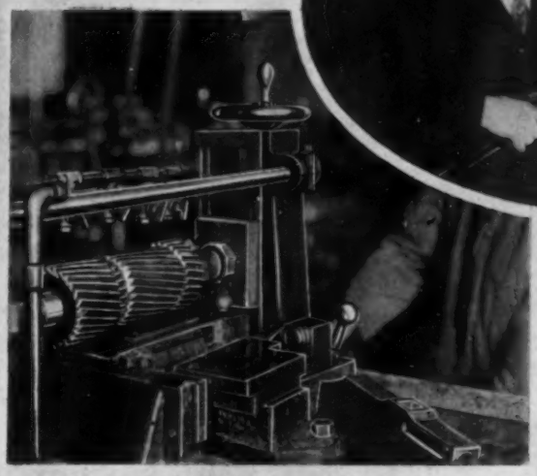
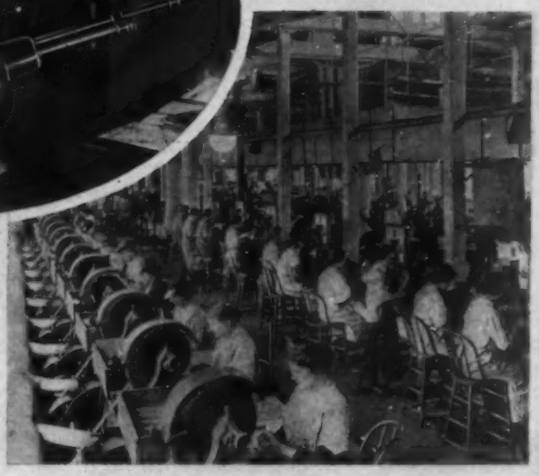
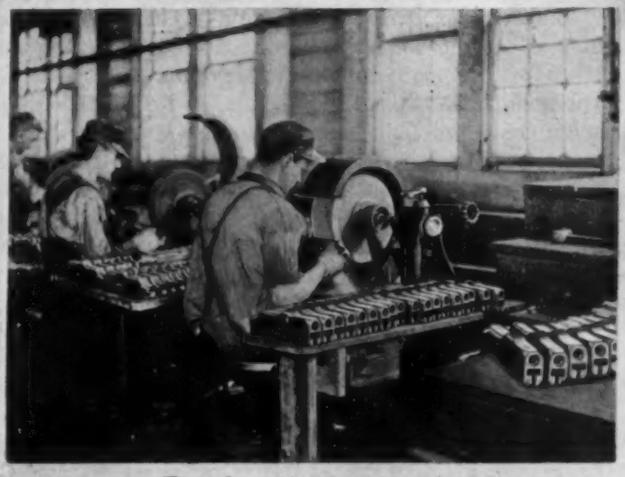


Milling receiver

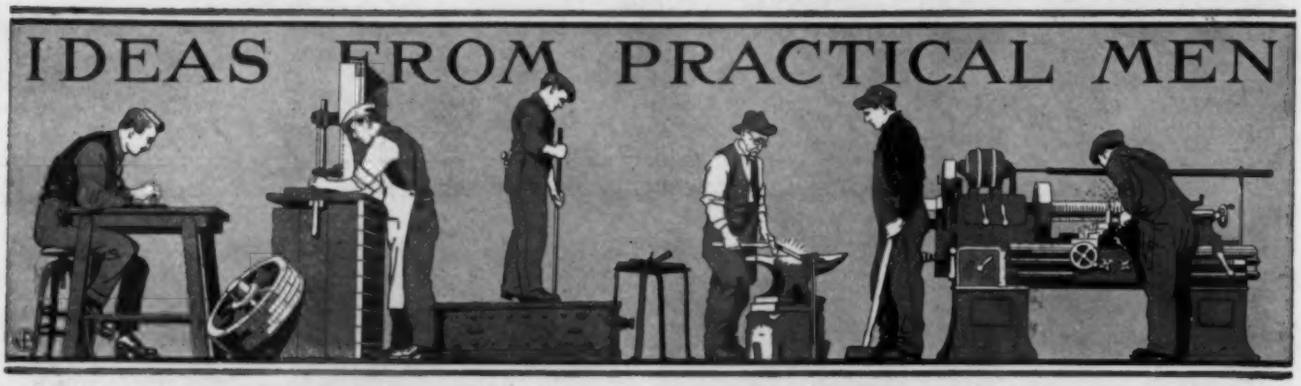


Polishing small parts



Final polishing receivers

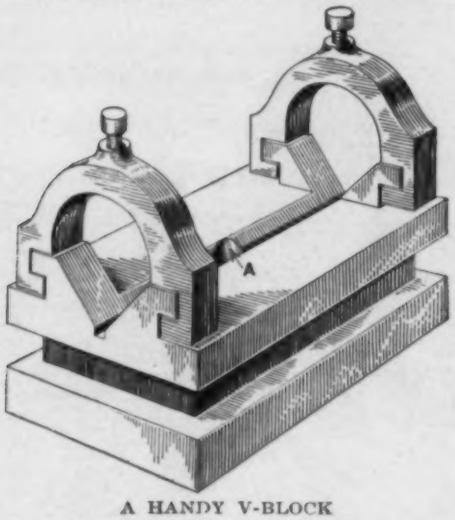
Testing the action



A Handy V-Block

By August Hollandt

A handy form of V-block is shown in this illustration. It may be made of any length to suit requirements and with one or more yokes, as may be needed. A center hole *A* carefully located with reference to the center



A HANDY V-BLOCK

of the V is of advantage in case it is desired to use the block on the faceplate of the bench lathe for the purpose of boring transverse holes exactly through the center of round pieces.

An Adjustable Punch and Die

By A. E. Holaday

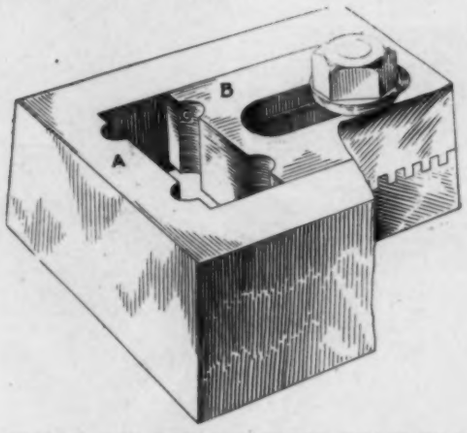
We had several hundred thousand flat brass blanks to make of $\frac{1}{32}$-in. stock 4 in. long similar to the shape indicated by the die and varying in width in the sizes $\frac{1}{2}$ in., $\frac{3}{4}$ in., 1 in. and $1\frac{1}{4}$ in. Quick delivery was required, and being short of tool and die makers I designed the adjustable die illustrated.

The blanks had to be made within very close limits, and delivery was required in lots of 2500 pieces of each size every day until the order was finished.

The die which I designed was made in two parts, as indicated, *A* and *B*. After making the $\frac{1}{2}$-in. blank the section *B* was moved back the distance of one of the cogs, milled in the bottom as shown, thus making the opening $\frac{3}{4}$ in. in width. This process was repeated for each width desired within the limit of the sizes demanded. The punch was similarly split in the middle, and spacers varying in thickness by $\frac{1}{4}$ in. each were inserted lengthwise for the various sizes to match the dies.

This enabled us to make the punch and die in a very short time and at small cost, after which we fulfilled quickly the delivery of the goods.

[It is questionable whether a die so designed would stand up for very lengthy service even for cutting sheet metal as thin as that specified. When the shearing strain comes on the edge of the movable section at *B*, it is probable that this would be forced down so that it would pinch in and quickly take the edge from the



ADJUSTABLE DIE FOR PUNCHING BRASS BLANKS OF DIFFERENT WIDTHS

corresponding side of the punch. Moreover it is a question whether this die would not require more time to construct properly than would a set of dies and punches for the four sizes indicated. The milling and fitting of the slots in the base would require much skill and time. A plain punch and die of the shape shown could probably be made in less than a day by a skillful toolmaker, with an allowance of less than three days' work for the four punches and dies required, while it is probable that the making of the adjustable punches and dies required at least as much or even a longer time. —Editor.]

Routeing by Means of Control Boards

By R. H. Wadsworth

The illustration shows a set of control boards which are used for the purpose of routeing the product through the planer department of the Cincinnati Planer Co. Each horizontal division on the board is assigned to a certain planing machine. The routeing clerk has a

record of the classification of work assignable to each planing machine in the department. From the monthly production sheet the clerk determines which product shall have preference. Monthly production sheets are made out for four months—the current month and the three following months—and indicate rating and name of machine, particular features, lot and machine number, date due to ship, agent's name and customer's name.

A number of small wooden blocks made to suit slots in the control boards are provided, and on the face of each is pasted a piece of white paper. The clerk writes with drawing ink the name of one job on each block and places that block in a slot in the control board opposite the number of the planer on which this job is to be done. He continues this till all jobs for the advance month have been assigned. The control boards are made up for two months—the current month and the advance month. When material is received the block carrying that job is marked with a stamp "material in." The clerk in charge changes the blocks on these boards daily as work progresses. The block at the left-hand end of the board indicates the job on the machine at the moment. The next block at the right indicates the next job, and succeeding blocks show the sequence of all the work assigned to any one planing machine. By observing this control board the foreman of the planing-machine department is informed of the order of work required. Once an hour the clerk receives by shop mail a dispatch notice (Fig. 2) giving information relating to the movement of product.

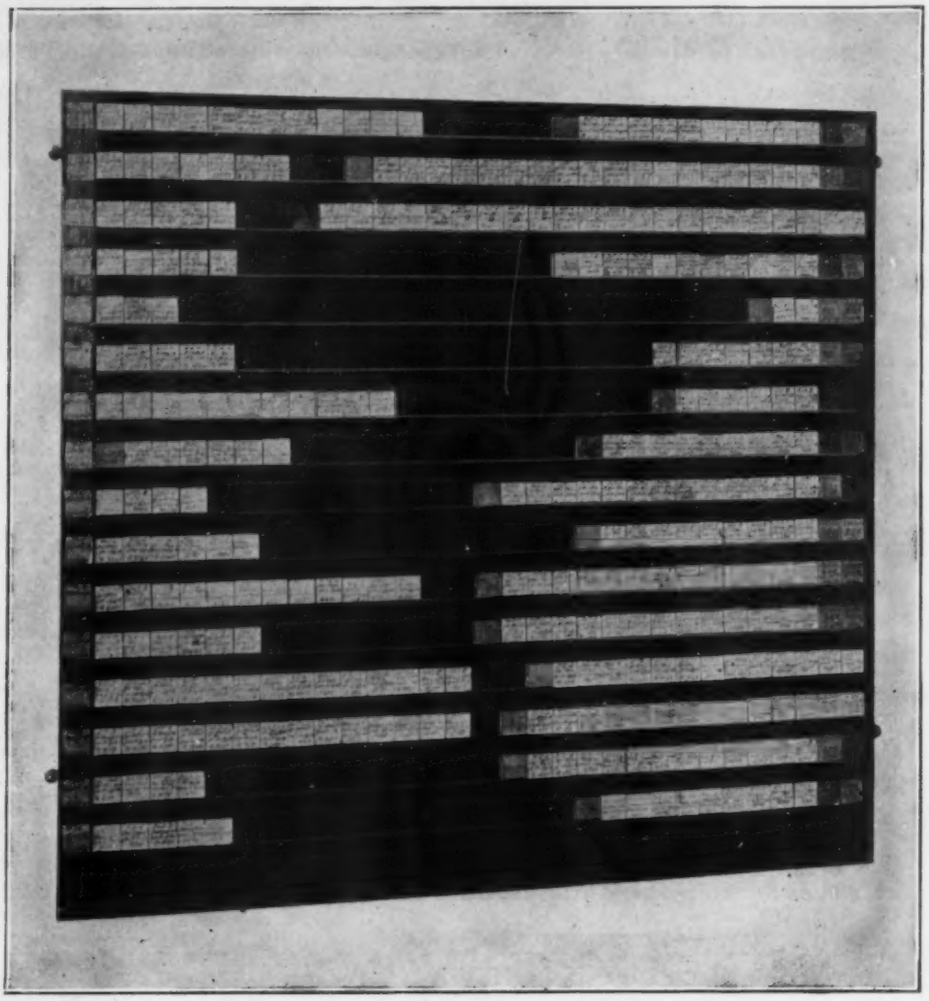


FIG. 1. THE CONTROL BOARDS

Dispatch Notice—Form 9— December 1917			Tracing Dept. 26 The Cincinnati Planer Co.
Order	Quantity	Date	Piece No.
FORWARDED FROM DEPT.		TO DEPT.	
OPERATION			
NAME OF PIECE			
Sent by	Received by	Tracer	

FIG. 2. DISPATCH NOTICE

The system is very flexible. If important material for a certain machine is not in the shop in time to make proper deliveries it is obviously inadvisable to continue other parts of that machine if there are parts of another machine that could be placed ahead of them to advantage. Hence if a block shows a job for which no material is on hand, other blocks indicating parts of the same machine may be taken from their places and other jobs moved forward. Then when material is available these relegated jobs may again be assigned.

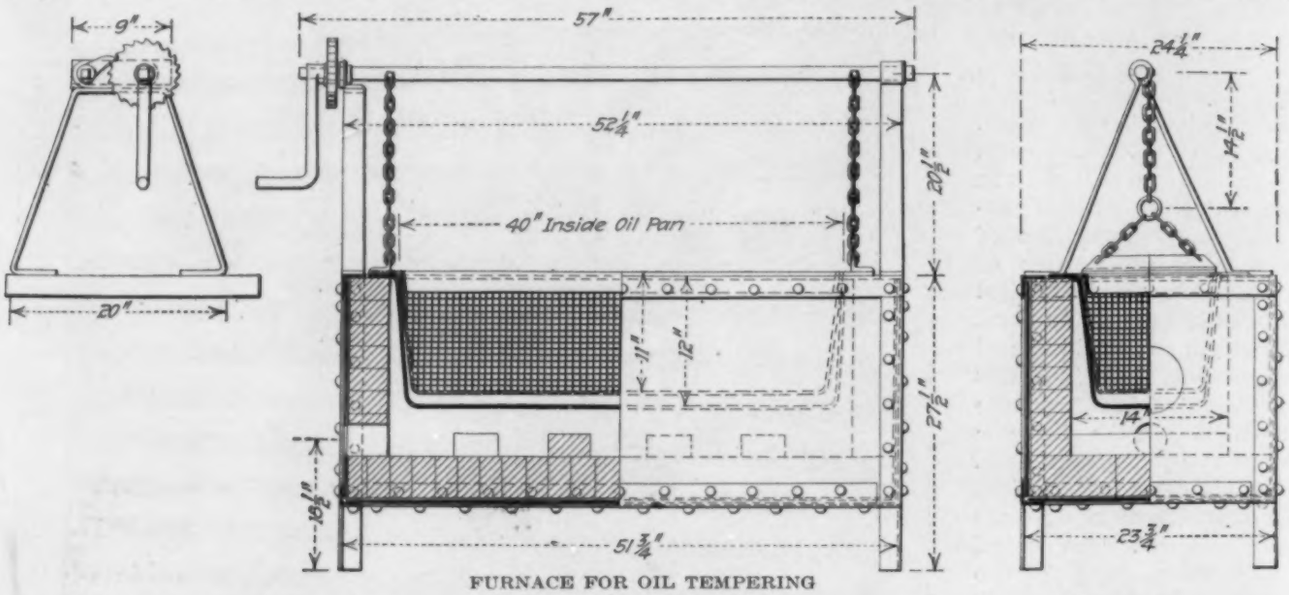
Blocks at the right-hand end of each row are marked with the number of working hours per month that may have been determined upon. For example, one machine runs days only; another days and overtime three nights a week and all day Saturday; another runs steadily day and night. The next block to the left shows the number of hours of work represented by the work already assigned to this machine. If the number of hours are in excess of the available number of hours per month it is clear to the management that some provision must be made to help out this machine, or production will fall.

Like every innovation, some difficulties were encountered in starting this one. The usual excuses were advanced, but after fair trial it has been found that these control boards are a distinct help in getting the product through the shop.

Furnace for Oil-Tempering Bath

By G. E. Baldwin

The illustration shows a furnace designed for steel parts which require tempering in hot oil. It consists of a brick furnace inclosed in a steel jacket. In this is suspended an oil pan lined with a wire basket which may be raised and lowered by chains fastened on the end of a shaft supported by wrought-iron brackets at either end and operated by means of a crank. The basket is raised when the chains are wound around the shaft. A ratchet at one end holds the basket in position while it is being filled or emptied.



FURNACE FOR OIL TEMPERING

This is a very cheap device and a simple one to make, and as it requires very little attention the upkeep is a small item.

Molding a Steel Crankshaft

By M. E. Duggan

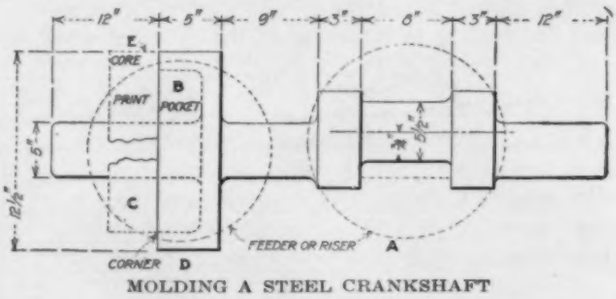
"Any pattern with two ends can be molded" is a common expression among old-time molders, but it does not always apply to patterns for steel castings.

By reason of the wide variety of patterns and the difficulties experienced in molding them, we may readily perceive that the skill of the workman will need to be exercised to the utmost. The designer will be called upon to exercise his intelligence in giving to each part the exact proportion that will enable it to fulfill its assigned duty with the smallest expenditure of material.

The design or drawing is sent to the patternmaker, but it merely shows the shape which is required in the finished casting, leaving entirely to the judgment of the patternmaker the way in which the pattern is to be made in order to mold well and produce a sound casting. A solid, or one-piece, pattern is easily and quickly made, is the least expensive, and the steel molder will not object for one or two castings.

A split pattern, however, is desired, indeed demanded, by the molder if many castings are wanted, as with it he can put up three molds in the time required to make two with a solid pattern. The crankshaft shown in the drawing is made with a ¾-in. throw, and ¼ in. of stock is allowed for machining; the shape of the pattern is to conform to the lines on the drawing. This is unnecessary in the case of a short-throw crankshaft because the molder will locate the "feeder," as indicated by the dotted circle *A* cutting away the sand so that the metal will be carried directly to the journals, cranks and crankpin. The rough appearance of the casting and the work of machining is given little consideration by the molder; he follows the method which experience has proved to be the safest and most expeditious.

When parts are to be cast in steel it should be the aim of the designer to equalize the distribution of metal in order to produce a solid casting. For this reason I would suggest that it be made with a cored pocket, as at *B*. The conventional way followed by most patternmakers is shown at *C*, but this is wrong, as the sand in the corner *D* will crush when the cope is being closed and thus spoil the mold. The proper way is shown at *E* where the core is flush with the periphery of the casting. Make the core long enough to be self supporting, and put large fillets on your pattern; if you don't the molder will.



MOLDING A STEEL CRANKSHAFT

The patternmaker must be familiar with the properties of steel, such as, for instance, its behavior at the point of solidifying, the strains to which a casting is subject, to what extent those strains may be modified by alterations of proportions or shape in the pattern, the shrinkage of castings and the alterations in form which take place in cooling.

Editorials

An Unwise Consolidation Is Proposed

A PLAN has been proposed to consolidate under one head the procurement, production and inspection of gages, and while it will be readily admitted that consolidations are often desirable, everything depends upon the proper management of the consolidation. Unless this is assured, consolidation might mean the disorganizing of the bulk of the work being carried on, has little to commend it and is to be condemned from every point of view.

* * *

Such a consolidation is now being proposed by certain sections of the War Department, and the Inspection Division of the Aircraft Production Board is bringing strong pressure to bear to have the entire gage proposition turned over to it and to transfer the testing of all gages from Washington to New York.

When we stop to consider that the Bureau of Standards has been designated by Congress as the place where all master gages are to be measured, checked and sealed, and that Congress has appropriated $375,000 for this work, the idea of tearing this up by the roots and bringing it to New York, especially at this time, is an absurd proposition and has some sinister aspects.

* * *

It must be further considered that the Ordnance Department uses at least four times as many gages as the Aircraft Division; that the Frankford Arsenal alone has bought in the neighborhood of $2,000,000 worth of gages during the past year, and that this department is by far the most important to be considered whenever gages are mentioned. As a matter of fact, practically the only really accurate gages needed by the Aircraft Production Board are those used in the building of airplane motors, for the Ordnance Department supplies every fighting plane with its machine gun, its ammunition, its bombs and bomb-dropping devices, and the bomb sights by which bombs are trained on the enemy's lines.

If there was ever a case of the tail trying to wag the dog, this seems to be it. And it would be hard to imagine anything more discouraging, not only to the Ordnance Department but to the whole engineering public, than to have this all-important work turned over to the Aircraft Production Board, which has made such a sorry showing in almost everything it has undertaken.

* * *

It may not be generally known that the Aircraft Production Board has recently purchased the former laboratory of the British Ministry of Munitions for testing its own gages, instead of using the equipment of the Bureau of Standards, which had always been at its disposal and which if not adequate for the purpose could have been sufficiently enlarged at a much lower cost. The starting of its own gage testing and sealing department, in view of the fact that it is but a small percentage of the Ordnance Department or of all the work being done at the Bureau of Standards, seems to have been hardly warranted from any point of view. But the proposal to take over the gage work of the Ordnance Department and place it 235 miles from Ordnance Headquarters is a colossal exhibition of nerve.

* * *

If the Aircraft Production Board had acquired a reputation for efficiency and had given good reason to believe that it could handle the gage situation better than the Bureau of Standards is handling it for the Ordnance Department, we should most heartily advocate the proposed change. But this is very far from being the case, and as the question of gages is so vital to the manufacture of munitions, which are needed in ever-increasing quantity, it would be inexcusable to turn such an important matter over to a department which has not as yet been so conducted as to secure the confidence of those who are familiar with its workings.

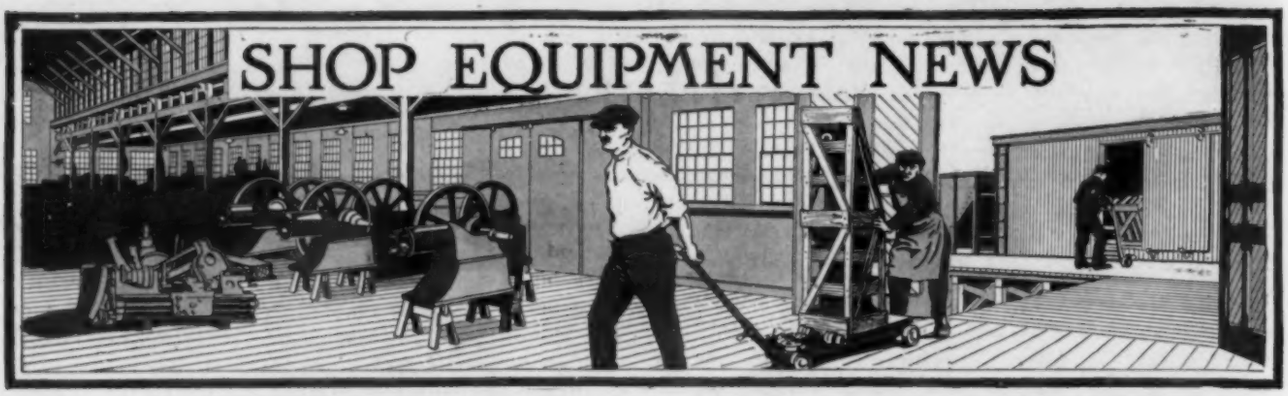
It is unbelievable that any change of this kind will be allowed to take place.

Capitalizing International Good-Will

IN PLEASING contrast to the many debit entries on our national balance sheet caused by war losses we are able to set down certain offsetting gains. Among these is the more or less intangible spirit of good-will toward us, which has developed greatly during the past year, an asset the concrete value of which will depend largely upon ourselves. There have been too many demonstrations of cordiality and approbation from all people lying outside the Teuton shadow to doubt the strength and reality of the new regard in which the United States is held by free nations. A cordial cable from one land, the honoring of our flag in another, a spontaneous street demonstration in still another—these signs show that the world has not been slow to recognize the high plane of our war motives and our generous readiness to expend not only our dollars but our irreplaceable treasures of youth and blood.

* * *

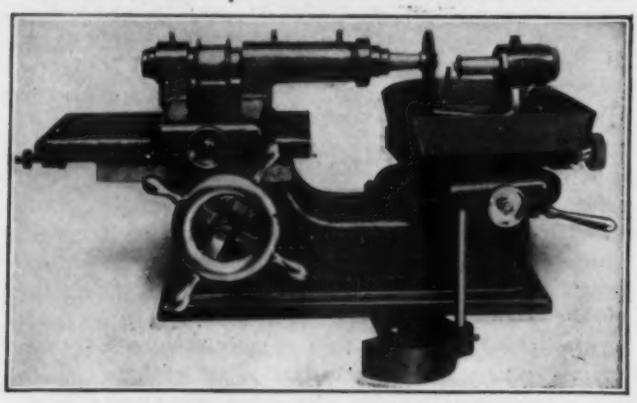
Are we to ignore or do nothing more than merely recognize this tremendous force of international good-will? Rather are we not justified or even bound to convert it into tangible form? Should we not seek to strengthen these ties and bind all civilized nations to us in friendly intercourse? Trading is essentially a mutually beneficial act in which each party profits. We should take steps to capitalize this present international good-will. Let us send our trade emissaries to the far corners; let us buy and sell with those who wish us well; let us build on this strong foundation of good feeling a great edifice of mutually profitable and agreeable foreign-trade relations.



This department is open to all new equipment of interest to shop owners. Photographs and data should be addressed to Editorial Department, "American Machinist"

Robbins, Gamwell Circular Cutter-Grinding Machine

Robbins, Gamwell & Co., Pittsfield, Mass., are now marketing the machine shown in the illustration, which is particularly designed for grinding convex and concave profile cutters. The capacity of the machine is cutters up to 7 in. in diameter. In convex grinding true half circles can be ground on the periphery of cutters not less than 3 in. in diameter, and arcs of circles less than 180 deg. can be ground with a radius depending upon the diameter of the cutter and ranging from 1⅝ in. on a cutter 7 in. in diameter to ¼ in. on a cutter 2 in. in diameter. On concave cutters a part of a circle slightly less than 180 deg. can be ground

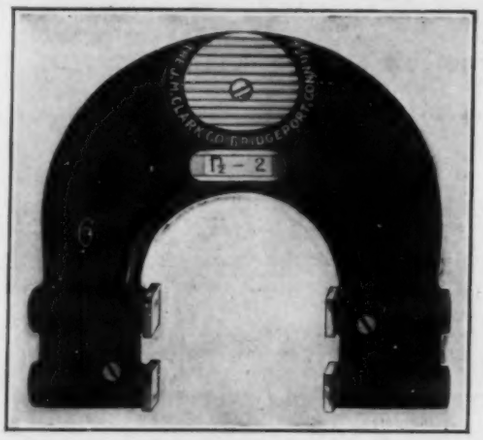


CIRCULAR CUTTER-GRINDING MACHINE

on a cutter not less than 3 in. in diameter. Cutters not ordinarily within the limits of the machine as regularly furnished, such as small ones with large radii, can be ground by means of special fixtures furnished as extras if desired. The spindle runs in bronze bearings, and provision is made for taking these up in case of wear. The equipment includes a 4-in. grinding wheel with a ½-in. hole and gage for setting the tooth rest. The weight of the machine is 245 lb. and the floor space occupied is 36 x 18 in.

Clark Adjustable Snap Gages

The illustration shows an adjustable snap gage made by the J. M. Clark Co., Bridgeport, Conn. This gage, now being equipped with square-headed plugs which permit measurements to be taken close up to a shoulder, is made in sizes overlapping each other from 0 to 12 in., the entire set consisting of 18 gages. The device may also be furnished with round heads if desired. A feature claimed for this line of gages is the extra-



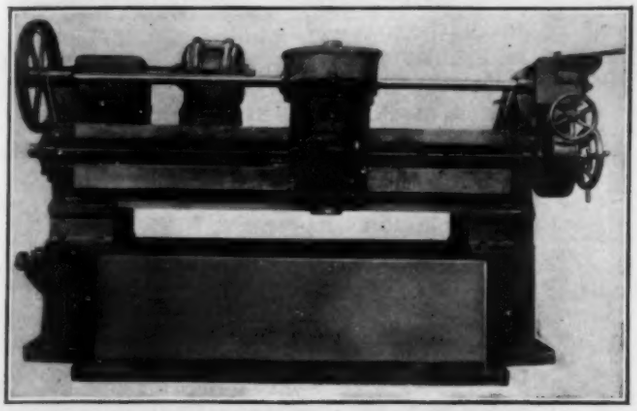
ADJUSTABLE SNAP GAGE WITH SQUARE-HEADED PLUGS

long bearing surfaces of the plugs and yokes cast of an iron that will not spring and take a permanent set if the gage is dropped.

Newton Deck-Plate-Scarf Milling Machine

The Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia, Penn., has recently placed on the market the milling machine shown in the illustration, which is for the purpose of milling the scarf on deck plates. The head has gear feed in both directions and the spindle saddle has cross-hand adjustment on the rail. The top surface of the base is finished and serves as a work table for clamping the plate, the area thus furnished being 9 ft. 2 in. between the uprights and 4 ft. 9 in. at right angles to the cross-rail. An oil pan is cast integral with the base, and pump, piping and attachments for carrying the lubricant to the milling cutters are provided. T-slots are machined in the top surface of the work table, these running parallel with the rails from one end of the table to the other. A number of drilled holes are also provided for locating stops to take the side thrust of the cut. Aligning slots are planed in the top surface of the table at right angles to the cross-rail in order to permit the locating

of plates in the most convenient position and to hold them square. The cross-rail of the machine was originally designed to be a portable unit and is therefore self-contained. The drive to the spindle is by means of a worm and wormwheel, the latter having a bronze ring with teeth of steep lead. The driving worm is of hardened steel fitted with roller thrust bearings and is incased for continual lubrication. From the worm and wormwheel the motion is transmitted through spur gears and a speed box giving six changes, the gears being mounted on sliding sleeves controlled by latch levers in the cover at the rear. This gives speed changes without the removal of any gears, the power being transmitted



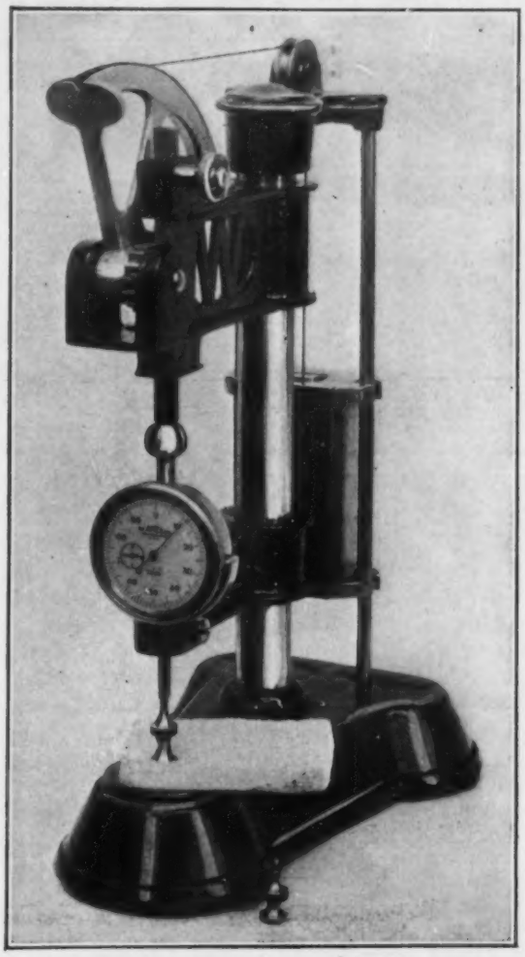
MILLING MACHINE FOR SCARF OF DECK PLATE

Diameter of spindle, 5 in.; vertical adjustment of spindle, 10 in.; maximum distance top of table to end of spindle, 10 in.; width between uprights, 9 ft. 2½ in.; length of feed available for the head on the cross-rail, 9 ft.; top surface of base, 9 ft. 2 in. between uprights and 4 ft. 9 in. at right angles to the cross-rails; feed changes, 6; horsepower of motor, 25; speed changes, 3.

from a 25-hp. motor at the rear of the upright. Three changes of speed are available in both directions, these being operated by means of gears. The spindle saddle is said to be of very heavy construction and is equipped with a narrow guide aligning feature while the vertical spindle sleeve is adjusted by means of a rack controlled by a worm and wormwheel hand movement.

"Widney" Resiliometer

The illustration shows the "Widney" resiliometer manufactured by the Advance Felt Specialty and Cutting Co., 233 South Jefferson St., Chicago, Ill. The device is for measuring the thickness, hardness and resiliency of materials such as felt, rubber, leather and other similar products. As may be seen, the instrument consists of a dial indicator on which is mounted a presser foot operating at right angles to the flat base of the machine on which the work is rested. The presser foot is pressed into the material being tested by means of a weight operating through a quadrant and a rack-and-pinion mechanism to the ball at the top of the dial indicator. In operation the quadrant is pulled forward and locked by means of a spring catch when the material can be placed under the presser foot and the normal thickness measured. The dial is graduated in 100 divisions, each of which represents 0.001 in., but the device is provided with an auxiliary small dial for use on materials more than 0.1 in. thick, which would cause the main pointer to make more than one revolution of the dial. After the normal thickness of the material has been noted the spring catch is released and the quadrant swung back until it bears on the ball at the top of the indicator. This impresses a force on the material being tested through the presser foot, and the reading now taken will give the relative



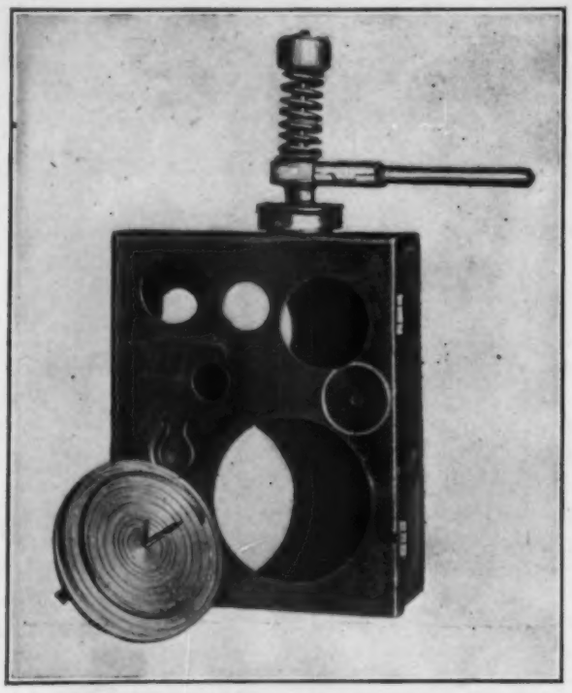
"WIDNEY" RESILIOMETER

hardness of the material. After this reading has been taken the quadrant is pulled back to relieve the material from pressure and the third reading gives the resiliency of the material.

"Misener" Rotary Hacksaw

Barnes & Irving, Inc., Syracuse, N. Y., are now marketing the "Misener" rotary hacksaw shown in the illustration, the device being intended for cutting round holes through thin sheet metal or other like uses. In the illustration the saw shown at the front is equipped with a square tapered shank for use in an ordinary bit stock, the device being held in place while the work is being done by means of the small twist drill seen projecting from the center. In the saw shown at the top of the work the twist drill has been replaced by a bolt so that the tool can be fed by means of the hand nut at the top acting through the helical spring just below it. The device may also be provided with cylindrical tapered shanks or with straight shanks for use in a drill chuck. The shanks are mounted with a sort of universal joint at the lower end so that the saw always stays flat against the work. As may be seen, the saws are cylindrical, all those except the

one for the proper size of hole being removed when the tool is in use. The saw-holding device is in two parts, the smaller cutting holes in sizes suitable for ¾-, 1-, 1¼- and 1½-in. pipe, while the larger, or outer, rotary is arranged to cut holes for 2-, 2½-, 3-, 3½- and

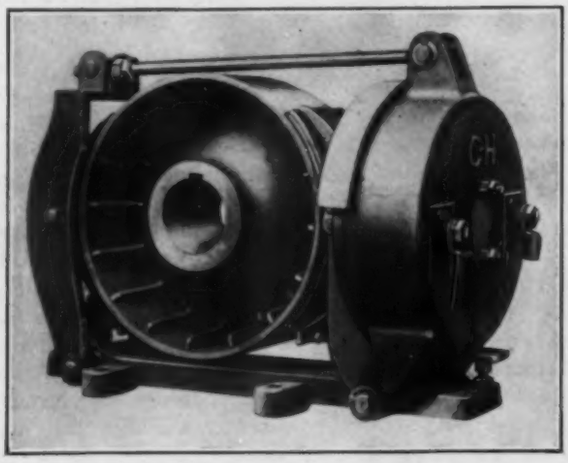


"MISENER" ROTARY HACKSAW

4-in. pipe sizes. The saws are ½ in. deep as regularly furnished, but can be furnished ¾ and 1 in. deep if desired. It is said that the device is also suitable for cutting holes in wood, marble, slate, fiber, plaster, tile, or wood or metal lath.

Cutler-Hammer Magnet-Operated Brake

The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has recently placed on the market the brake illustrated, which is for use on cranes, hoists, bridges,

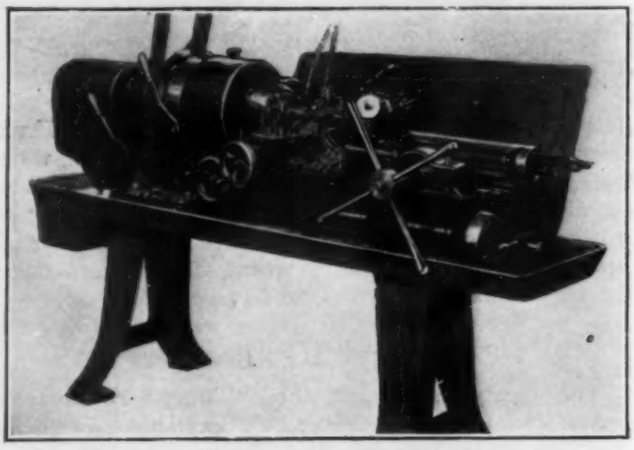


CUTLER-HAMMER MAGNET-OPERATED BRAKE

elevators, or other such installations. It is claimed that the device is particularly useful where quiet operation is required. By lowering the position of the magnet and making the magnet armature an integral part of one of the arms carrying the brake shoes the construction has been simplified, and fewer parts are required. Compactness is also secured and the parts are claimed to be stronger without adding excessive weight. The brake is applied by means of a spring located in the center of the coil, which tends to force the armature and magnet apart. The force acts directly in line with the center of the brake shoes, a feature that prevents any looseness due to wear in the brake linkage. This feature also makes the retarding torque the same regardless of the direction of rotation. The magnet is of the iron-clad clapper type working on a very small air gap. The armature and magnet are both movable and rotate on the same center, this construction reducing the angular movement on all bearings to less than one degree. It is claimed that this also eliminates the side friction found in magnets which have the armature mounted on a member extending through the center of the magnet coil. The brakes are manufactured in standard sizes varying from 8 to 30 in. in diameter and from 15 to 300 hp. capacity.

Wood Turret Lathe

The turret lathe shown in the illustration is one of the recent products of the Wood Turret Machine Co., Brazil, Ind. The machine is shown set up for producing the tailstock spindle of a well-known lathe, one of the



WOOD TURRET LATHE

spindles being in place in the chuck. As may be seen the turret is of the tilted variety and is six-sided, the stop screws for the various operating positions being shown projecting from the end of the slide.

Inspectors Wanted for Oil and Gas Fields

The Bureau of Oil and Natural Gas Conservation desires to secure the services of six field inspectors whose work will consist in visiting the larger oil and gas producing localities and ascertaining the amount of wastage of oil and gas. Eight fuel-oil combustion engineers are also needed.

As far as possible all are desired to volunteer their services to the Government during the period of the war, but if this cannot be done a fair remuneration with necessary expenses will be paid. Only men of experience in these lines need apply.

LATEST ADVICES FROM OUR WASHINGTON EDITOR

Washington, D. C., Aug. 10, 1918.—There seems little doubt as to change being made in the draft ages, and from present appearances these are to be extended in both directions so that more men who are now in our shops will be subject to the call. This promises to seriously affect manufacturing, which is already handicapped by a shortage of labor in a number of lines, and it is well to thoroughly understand the whole situation so that the disturbance may be minimized as much as possible.

An earnest effort is being made by the War Department to prevent the depletion of our manufacturing skill, and in order to make this as successful as possible it is necessary to have the complete coöperation of every manufacturer in the country. It is not claimed that mistakes were not made in the past, and it is unlikely that they will not be made now; but facilities are being provided whereby men subject to the draft can be returned to the shops if their services are actually needed. Much of the failure to do this in the first draft is attributed to ignorance or indifference on the part of the concerns employing highly skilled labor in failing to establish their status as being "necessary" before the draft board. The boards themselves are not perfect, although nearly all of them have done good, conscientious work in most cases.

Drafts on Skilled Help

In a few instances hasty action by local boards resulted in sending skilled men to camp between their employment in different factories, and some district boards have, with the best of intentions, overlooked their duty to protect essential industries in their desire to complete their quotas. While the present skilled-labor shortage was probably almost inevitable, in view of the huge Government program, it is nevertheless true that the army has made serious drafts on the skilled forces which were intended to remain at home to supply the armies in the field. This shortage requires drastic treatment, and this is what the War Department is endeavoring to administer at the present time.

As pointed out by Darragh de Lancey, chairman of the Second District Board of the State of Connecticut, in a recent address, the first and obvious thing to do is to get back to war industries all the skilled men now in the army whose skill is not being utilized where they are. There is no sense in making a trench fighter out of a toolmaker when munition production is faltering for want of 10,000 toolmakers at home.

Thanks to the cordial support of the men responsible for production, a machine has been set up for returning skilled enlisted men to industry by granting them a furlough of indefinite duration. This, with a similar arrangement which for a short time preceded it, has already resulted in the return to industry of some 4500 enlisted men, and it is estimated that over 15,000 will be returned by Aug. 1. This is not a large contribution, but it helps, since all are from the most highly skilled classes. At the same time it is an infinitesimal part of the army's fighting strength.

As our skilled-labor shortage is now estimated at 250,000, and is likely to approach a million by January, it is obviously necessary to carefully analyze the men still subject to draft and prevent increasing this shortage.

We must secure as many men as possible from the nonessential industries, and we must increase the training of both men and women in every way or we may allow our industrial army to reach too small proportions.

Coördinating the Work

There is no need to argue as to the necessity of giving this matter the closest attention, and according to Mr. de Lancey, what is most needed, and at once, is an agency which will coördinate the various phases of the war program and be charged with the duty of seeing that they are effectively carried out.

It is urged upon all manufacturers having skilled men who are likely to be affected by the draft to communicate with Darragh de Lancey, Room 237, State, War and Navy Building, Washington, D. C., who will give them all necessary information and put them in communication with the proper department in their state. Mr. de Lancey can also be of service to them in some cases in securing the return of specially skilled men now in the service but who have not been sent to the other side.

Every manufacturer should coöperate to the fullest extent.

The Ordnance Department has announced the establishment of a new production district to be known as the St. Louis Production District. Its headquarters will be at St. Louis, and M. E. Singleton of that city has been named ordnance district chief. The territory which this district will embrace in the St. Louis District, as well as the date on which the St. Louis office will start operations, will be given later. Under the new system production work in each district is under its own responsible head, who is answerable directly to the Ordnance Department in Washington.

Some time ago, in one of his communications to the workers of his department, Secretary of Commerce Redfield told them very clearly that this was the time to forget the way in which we did things before the war. This was his way of saying "Cut out all the red tape possible," and it is an admonition that might well be taken to heart by everyone in the United States, including those in the various branches of the service.

The Question of Orders

I mentioned some months ago how a quartermaster at an Atlantic port consistently and persistently refused to outfit a small body of men for special service in order that they might sail the following day because his regulations required that he must have a separate requisition for each man, giving the size of his clothes from his shirt to his shoes. The fact that this was a special unit much needed for special service and that individual requisitions could not be had in time did not matter in the least. "Orders were orders," and the fact that we were engaged in the greatest war the world has ever known was a mere detail in comparison with his book of rules.

Another case of this kind in which the same spirit of blind obedience to regulations is delaying the game and adding considerably to its cost has recently come to my notice. It had to do with the upkeep of some mechanical devices that are awaiting shipment to the other side. The work was to be done by a private contractor who found that he could save considerable money for the Government by doing the work where the machines were stored instead of having them shipped back to the factory.

The first snag which developed was that no suitable tools were available, and the officer in charge volunteered the information that with the method of procedure now in use it would take from six to eight weeks to secure the necessary equipment, although this consisted only of screwdrivers, pliers, small adjustable wrenches and light hammers. This in itself indicates that Secretary Redfield's suggestion has not been carried out in this department.

Couldn't Use His Own Tools

Upon learning this the contractor, in order to facilitate matters, purchased out of his own pocket sufficient tools to do the work. On bringing the tools to the machines he was informed that he would not be allowed to use them because the regulations contained something to the effect that all tools and supplies of this kind must be supplied by the United States Government.

Probably the man who framed such a rule had a perfectly good reason for so doing, but it is also probable that he did not expect an officer of ordinary intelligence to adhere to a strict interpretation of it such as in the case mentioned. While an officer could not be censured according to a strict interpretation of rules, he should be made to understand that we are at war, and that an officer who cannot exercise ordinary intelligence in an emergency is not the kind of man who can represent the spirit of progress which should typify this country.

It should also be remembered that no matter whether it is according to rule or not any action which delays the getting out of material or its shipment to the other side is in reality just as pro-German as though the man responsible for the delay was in the pay of the Kaiser. We are out to win this war, and it should be clearly understood that loyalty does not consist in blindly obeying rules which are obviously ridiculous in an emergency, for as far as the ultimate effect is concerned it is more disloyal to blindly follow rules which we know will delay matters than to break them for the good of the cause. The best example of this was when the young officer of the Adjutant General's department ordered the registration blanks printed and distributed without authority and by so doing made it possible for the first registration to be made in record time. We will do well to follow Secretary Redfield's admonition to forget how things were done before the war.

A Greeting to Chordal

By W. D. Forbes

Well, well! So we are to have Chordal again! That announcement gave me a thrill when I read it in the *American Machinist* of July 25, and his letter showed it was the same inimitable Chordal as of yore.

Most men whose hair is gray, on eating an apple and using great care not to disturb their bridge work or china teeth will assure you that apples are "not so good as they used to be," not comprehending that the change is in themselves and not in the apple. But while my hair is gray I find the same old flavor in Chordal's letters as of yore.

Yet, with the pleasure there is a tinge of sadness in his reminder that 30 years have passed since he answered his last letter from the *American Machinist*. Along these 30 years I have traveled, and as I look about I realize that many who started with me have "wrapped the drapery of their couch about them and lain down to pleasant dreams." For these the shadows have deepened and the hum of the busy world is forever hushed. It would be out of the question to name even a part of the many who have dropped out in these 30 years or of the great work done by them.

Things unthought of 30 years ago are commonplace today. An incident in connection with one of the great discoveries has always been interesting and amusing to me. I was living in the West Indies when the telephone was first given to the world, and on the island I resided on was stationed a regiment the officers of which I used often to mess with. One evening I was invited to a special dinner, and when I arrived at the mess hall the colonel of the regiment, a very fine man, was reading a New York paper. When he saw me he exclaimed, "Forbes, my but you Yankees are clever! Here is a chap named Bell who talks with a wire a distance of five miles, and mind you there is no hole in the wire either. My word, but that is a little too much to believe."

Yes, one of the old guard welcomes the return of Chordal, and the newer recruits of the *American Machinist* will soon look for his letters as we did. No one ever read anything of his without learning something new, gaining a new angle of thought or being made to enjoy an old one and get out of it that greatest of lubricants of daily life, a little humor. Welcome back, Chordal!

Mechanics Wanted for Overseas

The call for national service has been sounded for mechanics, superintendents and foremen in the mechanical trades to qualify as officers in the Ordnance Department of the United States Army. In order that full recognition shall be given to those who have acquired this highly mechanical knowledge and know how to apply it and direct men intelligently the commissions of captain, first lieutenant and second lieutenant will be granted, with corresponding pay and privileges.

These officers are placed in command of the mechanical crews stationed behind the lines for quick repair of tractors, motors, guns and other fighting ordnance equipment so that the advance of the army will not be held up. These units are of inestimable value in salvaging broken-down pieces and sending them back into action. These officers will be assigned to division ammunition trains, mobile ordnance repair shops and motorized field-artillery regiments.

All applicants must be over draft age and under forty years. They must be highly skilled mechanics of shop-foreman or manager type and experience, men who have had considerable practical automobile-repair experience and who can efficiently handle men in the shop as their actual superiors, instructing them as to what work should be done and how. It is necessary that they should have had actual machine-shop experience.

Graduates of mechanical-engineering schools without shop experience are not suitable, nor are men whose previous experience covers operation only, as they are unable to assimilate the training given by the Ordnance Department or to instruct their subordinates who make the actual repairs. It is not necessary that applicants be college graduates or members of engineering societies.

They should be practical men who understand the construction and maintenance of automobiles and tractors and know such problems as how to time motors, how to adjust carburetors, the causes of preignition, the setting of magnetos, how bearings should fit and important points regarding key fitting for taper shafts, etc. Applications will be considered on their merits, and arrangements made to give them personal consideration.

The Ordnance Officers' Examining Board will hold examinations in the following cities: Cleveland, Aug. 19 and 20; Detroit, Aug. 21 and 22; Chicago, Aug. 23 and 24; St. Paul, Aug. 26; Minneapolis, Aug. 27; Des Moines, Aug. 28; St. Louis, Aug. 29 and 30, and Indianapolis, Aug. 31.

Men living in or near one of these cities, who desire to apply, should obtain the preliminary application blank and instructions from the office of the Military Training Camps Association stationed in each of the cities noted. Applicants living in other districts should write to C. W. Jones, War Service Exchange, 596 State, War and Navy Building, Washington, D. C., stating training and experience in mechanical lines.

$25,000,000 Shop for France

The Chief of Ordnance has approved plans for the manufacture of the machine-tool equipment which the United States Government will install in France for the relining of the heavy railroad guns in use by the American forces.

The project for this relining plant is one of the largest undertaken by the Ordnance Department, and calls for the expenditure of between $25,000,000 and $30,000,000. In size it will be comparable to the Krupp Works at Essen, Germany. The machine tools alone will cost between $12,000,000 and $15,000,000, and will consist of gun-boring lathes, engine lathes, rifling machines and grinding machines.

A large number of these gun-boring lathes are designed for a 102-in. swing, and to make them there is under construction at one of the machine-tool factories in this country a giant planing machine, the base of which is so long that the curvature of the earth has to be taken into consideration in building it. It is 500 ft. long, nearly the length of the Washington Monument or the battleship "North Dakota." This planing machine alone is to cost $450,000, and the lathes it will help make will approximate in the aggregate $6,500,000. Prior to the war the longest planing machine ever built was not more than 80 ft. So long a stretch of ground will this greater one cover that in order that its two ends might be in perfect alignment a correction had to be made in the design to take care of the earth's curvature.

In addition to the machine-tool equipment the relining plant in France will include extensive shrinkage pits, giant 240-ton traveling cranes, an electrical generating plant of several thousand kilowatt capacity, a large battery of boilers, and suitable buildings.

Engineering work by the Ordnance Department in the development of the entire project was completed in less than 30 days after its inception. In that period the plans have been reviewed and approved by the Chief of Ordnance, the project has been passed by the clearance committee of the War Industries Board, negotiations have been concluded with machine-tool builders, and procurement orders have actually been issued for the production of the gun-boring lathes of the types required.

The relining of big guns is one of the biggest salvage operations in the war. Several times the value of these big guns is saved by this process. Owing to the tremendous heat generated by the charge when the big guns are fired their accuracy cannot be assured after a few hundred shots unless they are relined, notwithstanding the fact that all other parts except the lining are practically as good as new. When a gun is brought into the shop to be relined the old lining is first bored out. The jacket is then heated, a new lining inserted, and the gun dipped into a shrinkage pit, which shrinks the jacket tightly around the new lining. This process may be repeated several times with every gun.

Col. Thompson Supervisor of Arsenals

Announcement has been made by the Ordnance Department of the designation of Col. John T. Thompson, United States Army, retired, as supervisor of manufacturing arsenals vice Col. S. E. Blunt, United States Army, retired. Along with his new duties Colonel Thompson will continue to serve as advisory engineer to the Chief of Ordnance.

Colonel Thompson was in charge of the development of the United States Model 1917 rifle, and saw this model through to quantity production. Up to July 20, 1918, a total of 1,469,846 rifles of this type had been produced, inspected and accepted.

Condensed-Clipping Index of Equipment

Clip, paste on 3 x 5-in. cards and file as desired

Generator Set, Direct-Current Turbo-

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn.

"American Machinist," July 11, 1918

This set is at present made in two sizes, 8.5-kw. and 10-kw. capacity. Operate on pressures from 80 to 235 lb. at the inlet and 0 to 10 lb. back pressure. Among the features are hand- and automatic-throttle control and an emergency overspeed governor. There is but one revolving element composing the generator, the shaft being extended so that it carries the turbine rotor. It is claimed that this construction not only makes a very compact machine, but eliminates all coupling and misalignment troubles and dispenses with turbine bearings and packings. The blades are of the impulse type, the steam passing through the blades a second time to allow complete expansion. Self-aligning ball bearings are used and all open places are covered with expanded metal. The dimensions of the 10-kw. set are 3 ft. 8½ in. long, 23 in. wide and 18½ in. high.

Coupling for Steel Belts

Cruban Machine and Steel Corporation, 2 Rector St., New York City

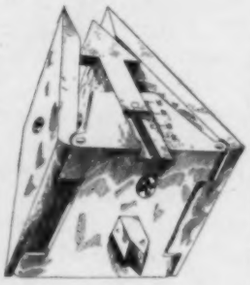
"American Machinist," July 11, 1918

A band-steel belt is very efficient and costs less than a leather one, but a serious objection to its use has been the difficulty of coupling or joining the ends. The coupling as here illustrated is cut from bars of specially drawn steel which may be cut off in lengths to suit any width of belt. In use the ends of the belt have holes drilled or punched in them to match the screw holes in the coupling and are thus firmly clamped between the parts A and B. The part B has its inner surface curved to the radius of the pulley on which the belt is to run.

Jig for Grinding Tool Bits

Lafayette Tool Works, 176 Worth St., New York City

"American Machinist," July 11, 1918



Intended to hold tool bits, such as thread cutters, engraving cutters, routers and the like, so that accurate surfaces or angles may be ground on them. The sides of the jig are hinged so that the angle to which the tool is to be ground may be obtained, graduations indicating the angle, which may be from 60 to 29 deg.. The angle desired is given to the wings by adjusting the arrow-shaped slide in the center and also a locking screw in each wing.

Drilling Machine, "Dumore" Type A

Wisconsin Electric Co., Racine, Wis.

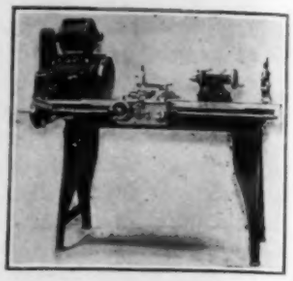
"American Machinist," July 18, 1918

Adapted for light, sensitive work. The motor is of the variable-speed type, giving speeds from 500 to 10,000 r.p.m., the controller being placed on the floor and regulated by a foot pedal. The table is adjustable and has a movement in relation to the drill of ¾ in. A No. 1 Jacobs chuck is used, and this together with the moving portion of the motor is claimed to be in dynamic balance. Holes may be drilled up to $\frac{1}{16}$ in. in diameter in steel and ¼ in. in diameter in soft alloys, the machines being of such size as to drill holes to the center of a 5-in. circle.

Lathe, Geared-Head Semi-Quick-Change 12-In.

Shepard Lathe Co., Canal and Jackson Sts., Cincinnati, Ohio

"American Machinist," July 11, 1918



A 12-in. geared-head, semi-quick-change, screw-cutting engine lathe which may be equipped for various styles of drive, including motor, with the motor mounted either on the rear leg or on top of the headstock, and also countershaft and single-pulley drive. The lathe is claimed to contain all the advantages of the complete-quick-change lathe, and the various feeds may be changed or reversed without stopping or shifting belts. When threading, the lead-screw nut remains in constant engagement. Spindle speeds, six, 32 to 502 r.p.m.; face of headstock gears, ⅞ in.; hole through spindle, 1 in.; weight, 800 to 900 lb.

Dresser for Emery Wheels, "Metcalf"

Baldwin, Tuthill & Bolton, Grand Rapids, Mich.

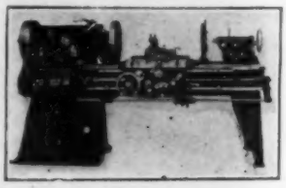
"American Machinist," July 11, 1918

This device consists of two heavy knobs on the ends of a short shaft, with an abrasive wheel of special grade and grit mounted on a sleeve between them. The knobs are of iron to give weight and are held in the hands while the dresser is pressed against the wheel to be trued. The principles claimed for this device in truing a wheel are, first, the inertia due to the weight of the iron balls; second, the cutting effect of one abrasive wheel on another when held at an angle of from 30 to 40 deg. to the horizontal; and third, the gyroscopic action set up by the rapid rotation of the wheel on its axis. These features, it is claimed, make its operation very rapid and also permit it to bring up a sharp corner on thin or delicate wheels. The device when held about horizontal gives a coarse, open face to the wheel, while a fine, close-grained face for finishing work is secured by holding the dresser nearly vertical.

Lathe, Geared-Head, Single-Lever Control, 16- to 30-In.

Greaves-Klusman Co., Cincinnati, Ohio

"American Machinist," July 11, 1918



Made in five sizes, 16 in. by 6 ft., 18 in. by 6 ft., 20 in. by 8 ft., 24 in. by 10 ft., and 30 in. by 10 ft., the dimensions of the 20 in. by 8 ft. size being as follows: Swing over bed, 22¼ in.; swing over carriage, 14¼ in.; distance between centers with tailstock flush, 46 in.; distance between centers with tailstock extended, 51 in.; front spindle bearing, 4½ x 6½ in.; rear spindle bearing, 3½ x 4½ in.; diameter of hole through spindle, 1⅞ in.; friction-drive pulley, 16 x 5¼ in.; spindle speeds, 8.5 to 300 r.p.m.; diameter of spindle nose, 4¼ in., with pilot 3 in. in diameter, 1½ in. long; threads cut, 1 to 56, including 11½; range of feeds, 6 to 336; taper of centers, No. 4 Morse; tailstock spindle, 2⅛ x 18½ in.; travel of tailstock spindle, 10 in.; length of carriage, 31 in.; width of bridge, 9 in.; travel of compound rest, 7 in.; size of tools, ⅞ x 1¼ in.

Valve, Accumulator Protective

Hydraulic Press Manufacturing Co., Mount Gilead, Ohio

"American Machinist," July 18, 1918

Intended to be installed directly at the outlet of the accumulator with the pilot line connected to the piping system. Pressure from the liquid of the pumps lifts the main check and charges the accumulator, and at the same time the pressure lifts the plunger in the small cylinder, thus holding the main check off its seat as long as the pressure on the pilot line is maintained, whether the accumulator is being charged or discharged. Should a break occur in the piping system the pressure is lowered, allowing the spring to lower the small plunger, when the flow of liquid assisted by a spring above the check causes this to seat, thus preventing a falling off in the accumulator.

Patent Applied For

Personals

William V. Dee has resigned the position of secretary and general sales manager of the G. Drouve Co., 40 Drouve St., Bridgeport, Conn.

Lester P. Lane has severed his connection with the Smiley Steel Co., New York. Mr. Lane was vice president and sales manager of this company.

C. M. White, formerly connected with the Detroit Steel Products Co., Detroit, Mich., has been appointed sales manager of the Firestone Steel Products Co., Akron, Ohio.

C. S. Parsons of the Mines Branch, Ottawa, Canada, has been made superintendent of the Joseph Dixon Crucible Co.'s graphite mill and mine at Graphite, N. Y.

C. Edwin Clarke is now master mechanic of the Saucon plant of the Bethlehem Steel Co., Bethlehem, Penn. He was formerly chief engineer of the Wilmington Steel Co., Wilmington, Del.

Joseph H. Cheetham, at one time chief mechanical engineer of the McNab & Harlin Manufacturing Co., Paterson, N. J., is now superintendent of the Kunkle Valve Co., Fort Wayne, Ind.

M. G. White, who was chief inspector at the aviation plant of the Nordyke & Morman Co., Indianapolis, Ind., is now sales engineer for the U. S. Ball Bearing Manufacturing Co., Chicago, Ill.

Francis R. Crute has given up his position with the Champion Fiber Co., Canton, N. C., to take a position as aero mechanical engineer, naval aircraft factory at the navy yard in Philadelphia, Penn.

E. J. Cullen has resigned his position as assistant superintendent of the Ohio Injector Co., Wadsworth, Ohio, and has become superintendent of the Johnson Gas Appliance Co., Cedar Rapids, Iowa.

William L. Lindsley, who was formerly with the Trumbull Steel Co., Warren, Ohio, is now associated with the sales organization of the W. J. Crouch Co., Inc., steel exporter, 68 William St., New York.

Harry B. Chapman has entered the service of the Westinghouse Electric and Manufacturing Co., Machine Works, East Pittsburg, Penn. He was manager of the Chapman Engineering Co., Texas City, Tex.

August H. Lane, has taken a position in the Engineering Department of the Government at Watervliet Arsenal. He was formerly employed by the Grant Hammond Manufacturing Corporation, New Haven, Conn.

Edward J. Albert, for the past five years manager of the mining and power department of the Canadian Allis-Chalmers, Ltd., has resigned to become sales manager of the Thwing Instrument Co., Philadelphia, Penn.

William Harrower, is now mechanical engineer designing special machinery for Warneke & Hay Co., Inc., 51 Maiden Lane, New York. He was formerly mechanical engineer of the Brewster Co., Long Island City, N. Y.

Terrell Croft, consulting electrical engineer of St. Louis, Mo., was recently called to Washington by the Educational Committee of the War Department, and is now in charge of the work of standardizing the electrical courses for enlisted men.

Wm. C. Willard, recently plant engineer of the Kilbourne & Jacobs manufacturing Co., Columbus, Ohio, has been transferred to the production department and appointed planning engineer at the head of the planning department, a new department.

Herbert Farrell, president of the Farrell Cheek Steel Foundry Co., Sandusky, Ohio, has been appointed treasurer and chairman of the executive committee of the Dauch Manufacturing Co. of the same city. This company is building farm tractors.

H. W. Belnap, formerly chief of the Bureau of Safety in the Interstate Commerce Commission, has been transferred to the Safety Section of the Federal Railroad Administration. **W. P. Borland** is now chief of the Division of Safety of the commission.

E. J. Kearney, secretary and treasurer of the Kearney & Trecker Co., Milwaukee, Wis., and **F. H. Claussen,** president of the Van Brunt Manufacturing Co., Horicon, Wis., have been appointed representatives of manufacturers on the Wisconsin State War Labor Board.

W. H. Workman, general manager of the Handley-Page Airplane Co., London, Eng., is now in St. Louis, conferring with the St. Louis Chamber of Commerce and the Manufacturers' Association regarding the establishment of a plant in that city for the manufacture of airplanes.

Fred Berger, who was chief engineer of the Abbott Motor Corporation, Cleveland, and when in Detroit chief engineer of the Oakland Car Co., Pontiac, Mich., and sales manager of the Muir Carburetor Co., which position he resigned to join the Abbott company, has returned to Detroit as engineer of the Gray Motors Co.

George M. Brill has been appointed head of the requirement section of the Emergency Fleet Corporation "to keep in touch with the shipyards and learn from them in a general way the amount of materials, supplies and equipment required for extensions." He is already head of the requirement section of the United States Shipping Board.

Harry J. Warner has been appointed vice president of the Federal Motor Truck Co., Detroit, Mich., and a member of the executive committee and board of directors, and will have complete charge of production. Mr. Warner was for 12 years with the Continental Motors Corporation, where for six years he was vice president in charge of production.

Business Items

General Machine and Tool Works, makers of wood and metal patterns and stampings, are now located at Cedar Rapids, Iowa.

The Atlantic Manufacturing Co., manufacturer of screw-machine products, is now occupying its new plant on New Haven Ave., Milford, Conn. This company was formerly located at Bridgeport, Conn.

The American Multigraph Co., Cleveland, which is largely engaged on munition work, has almost entirely substituted women for men employees for inspection and light-machine work. It is at present giving employment to more than 900 women.

The Independent Pneumatic Tool Co. has leased the sixth floor in the Otis Building, 600 West Jackson Blvd., Chicago, Ill. The floor will be occupied by the company as its general offices. Removal into the new quarters will be effected about Sept. 1, 1918.

The Stocker-Rumely-Wachs Co., dealer in machine tools, 117 North Jefferson St., Chicago, Ill., held a meeting of its directors on July 23 and elected William N. Rumely, formerly vice president, as president to fill the vacancy caused by the recent death of H. A. Stoker. C. L. Wachs, always a director was made vice president, and A. J. Sullivan, who has been connected with the firm for a number of years, was elected a member of the board of directors. The other officers will remain the same and there will be no change in the policy of the company.

The Standard Parts Co., Cleveland, Ohio, recently made a number of changes in its organization. W. L. Woodward has been promoted from assistant manager to manager of the rim and tube plant in Cleveland, succeeding J. C. Manternach. F. F. Grimmelsman, who was assistant manager of the spring and axle plant in Canton, has been appointed manager of the Perfection spring plant in Cleveland. J. L. Loose, formerly with the Hendee Manufacturing Co., has been made manager of the spring and axle plant in Canton, succeeding J. B. Childe, who is now connected with the general office organization in Cleveland. B. R. Winborn, formerly general manager of the Perfection heater sales force, has been made general manager of that division. H. H. Newsom, director of purchases, has been called into service by the aircraft division of the Government and has been granted six months' absence. He is located at the plant of the Livingston Radiator Co., New York.

Trade Catalogs

Electrical Specialties. Steel City Electric Co., Pittsburgh, Penn. Catalog No. 33. Pp. 108; 6 x 9 in. This catalog cancels and supercedes bulletins Nos. 21, 22, 25, 26, 27, 28, 29, 30 and 31. Each article is illustrated and described, giving the size, number, code word, price, etc.

Bulletin of Bureau of Standards. Department of Commerce, Washington, D. C. The contents are as follows: Some electrical properties of silver sulphide; axial aberrations of lenses; wave-length measurements in spectra from 5600A to 9600A; specific heat of liquid ammonia; the latent heat of pressure variations of liquid ammonia; latent heat of vaporization of ammonia; gas interfermeter calibration, and resonance and ivorization potentials for electrons in cadmium vapor.

New Publications

An Investigation of Twist Drills—By Bruce W. Benedict and W. Penn Lukens. One hundred and forty-four 6 x 9-in. pages; 59 tables, charts and illustrations. Paper cover. Published by the University of Illinois, Engineering Experiment Station, Urbana, Ill. Price, 60 cents.

This is an account of extensive drill tests carried out at the University of Illinois and contains much of interest to the mechanic and engineer. The chapters deal with Methods Employed and Apparatus Used in Conducting the Tests; Power Tests of Twist Drills; Tests to Determine Drill Endurance; Minor Investigations; Conclusions. The Appendix deals with the Development of the Twist Drill; Drill Grinding; Lubrication of Drills; Drill Testing; Experiments on Twist Drills by Other Investigators; Bibliography.

Machine and Fitting Shop Practice, Vol. 1—By George W. Burley. Two hundred and eleven 4½ x 7-in. pages; 194 illustrations and 3 tables. Bound in cloth. Published by Scott, Greenwood & Son, London. For sale by D. Van Nostrand Co., New York. Price, $2.

This book is the first of a series intended for the use of apprentices in shops, schools and technical institutes. The various subjects are treated in a very elementary manner, and for those the book intends to reach a comprehensive survey of modern small tools is given. The range of the present volume is measurements and gaging, laying out work, vise work, chipping, filing and scraping. Drawings of practically all of the small tools in common use are shown, and brief descriptions of the construction and use accompanies each one. The various chapters deal with Materials of Construction; Shop Measurements and Measuring Instruments; Gaging and Gages; Laying Out Tools and Operations; The Vise; The Hammer and Chisel; Chipping; Files: Their Forms and Uses; Scrapers and Scraping. The Appendix gives tables for fractional and decimal equivalents, metric and English equivalents and height differences for standard sine bar.

Forthcoming Meetings

American Gear Manufacturers' Association will hold its semi-annual meeting at the Onondaga Hotel, Syracuse, N. Y., Sept. 19, 20 and 21.

American Society of Mechanical Engineers. Monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West 39th St., New York City.

Boston Branch National Metal Trades' Association. Monthly meeting on first Wednesday of each month. Young's Hotel. Donald H. C. Tullock, Jr., secretary. Room 41, 166 Devonshire St., Boston, Mass.

Engineers' Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

New England Foundrymen's Association. Regular meeting, second Wednesday of each month. Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Philadelphia Foundrymen's Association. Meetings first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Providence Engineering Society. Monthly meeting fourth Wednesday of each month. A. E. Thornley, corresponding secretary, P. O. Box 796, Providence, R. I.

Rochester Society of Technical Draftsmen. Monthly meeting, last Thursday. O. L. Angevine, Jr., secretary, 857 Genesee St., Rochester, N. Y.

Superintendents' and Foremen's Club of Cleveland. Monthly meeting, third Saturday. Philip Frankel, secretary, 310 New England Building, Cleveland, Ohio.

Technical League of America. Regular meeting, second Friday of each month. Oscar S. Teale, secretary, 35 Broadway, New York City.

Western Society of Engineers, Chicago, Ill. Regular meetings, first, second, third and fourth Mondays of each month, except July and August. Edgar S. Nethercut, secretary, 1735 Monadnock Block, Chicago, Ill.

WEEKLY PRICE GUIDE OF

IRON AND STEEL

The Government Schedule of steel prices went into effect Sept. 24. Pig iron was set at $33 per ton; pig iron differentials were announced by the American Iron and Steel Institute on Nov. 3. Washington announced sheet and pipe prices on Nov. 5. Warehouse prices have been revised, as shown, by agreement between the War Industries Board and the warehouses; new schedule in effect Nov. 15. Effective Apr. 1, the price of basic iron was fixed at $32, and standard Bessemer at $35.20 at Valley furnace, prices of other irons remaining the same as last quarter.

PIG IRON—Quotations per ton were current as follows at the points and dates indicated:

	Current	One Month Ago	One Year Ago
No. 2 Southern Foundry, Birmingham	$33.00	$33.00	$47.00
No. 2X, New York	34.40	34.40	53.00
No. 2 Northern Foundry, Chicago	33.00	33.00	55.00
*Bessemer, Pittsburgh	35.20	36.60	55.95
*Basic, Pittsburgh	32.00	32.00	52.95
No. 2X, Philadelphia	34.40	34.40	54.50
*No. 2, Valley	33.00	33.00	53.95
No. 2 Southern Cincinnati	36.90	36.90	49.90
Basic, Eastern Pennsylvania	32.90	32.90	50.00

*Delivered Pittsburgh; f.o.b. Valley, 95 cents less.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.245	$4.195	$5.25	$4.17	$4.50	$4.27	$5.00
Soft steel bars	4.145	4.095	5.00	4.07	5.00	4.17	4.50
Soft steel bar shapes	4.145	4.095	5.00	4.17	4.50	4.17	4.50
Soft steel bands	4.995	....	....	....	....	....	....
Plates, ¼ to 1 in. thick	4.495	4.445	10.00	4.42	8.00	4.25	8.00

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Pittsburgh, mill	$3.50	$5.25
Warehouse, New York	4.75	4.75
Warehouse, Cleveland	4.10	4.95
Warehouse, Chicago	4.10	4.50

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill, in Carloads	New York			Cleveland		Chicago	
		Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
*No. 28 black	5.00	6.495	6.445	10.50	6.42	9.00	6.52	10.00
*No. 26 black	4.90	6.395	6.345	10.40	6.32	8.90	6.42	9.90
*Nos. 22 and 24 black	4.85	6.345	6.295	10.35	6.27	8.85	6.37	9.85
Nos. 18 and 20 black	4.80	6.295	6.245	10.30	6.22	9.20	6.32	9.80
No. 16 blue annealed	4.45	5.695	5.645	10.20	5.62	9.20	5.72	10.20
No. 14 blue annealed	4.35	5.595	5.545	10.10	5.52	9.10	5.62	10.10
No. 10 blue annealed	4.25	5.495	5.445	10.00	5.42	9.00	5.52	10.00
*No. 28 galvanized	6.25	7.745	7.695	13.00	7.67	10.75	7.77	11.50
*No. 26 galvanized	5.95	7.445	7.395	12.70	7.37	10.45	7.32	11.20
No. 24 galvanized	5.80	7.295	7.245	12.55	7.22	10.30	7.47	11.05

*For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages.

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring at least 1000 lb. of a size (smaller quantities take the standard extras) the following discounts hold:

	Current	One Year Ago
New York	List plus 12%	List plus 25%
Cleveland	List plus 12%	List plus 10%
Chicago	List plus 13%	List plus 10%

DRILL ROD—Discounts from list price are as follows at the places named:

	Extra	Standard
New York	35%	40%
Cleveland	35%	40%
Chicago	35%	40%

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots, is:

	Current	One Year Ago
New York	$15.50–19	$14.00
Cleveland	20.00	13.30
Chicago	19.00	12.50

In coils an advance of 50c. usually is charged.

Note—Stock very scarce generally.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100-lb. lots and over:

Welding Wire*

5/16, 11, 7/32, 1/4, 7/32, 3/16 No. 8, 5/16 and 25c. 10	22.10 to 33.00
1/8	
No. 12	
5/32, No. 14 and 7/64	
No. 18	
No. 20	

* Very scarce.

Cast-Iron Welding Rods

1/4 by 12 in. long	16.00
1/4 by 19 in. long	14.00
3/8 by 19 in. long	12.00
1/2 by 21 in. long	12.00

Special Welding Wire

1/8	33.00
5/32	30.00
7/64	38.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Tire	4.15	4.07	4.17
Toe calk	5.75	4.65	4.32
Openhearth spring steel (heavy)	8.00	8.00	7.60
Spring steel (light)	11.00	11.25	11.90
Coppered bessemer rods	9.00	8.00	7.07
Hoop steel	4.99½	4.75	5.02
Cold-rolled strip steel	8.50	8.25	8.57
Floor plates	6.50	6.00	7.07

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	44%	17½%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	40%	22½%	⅜ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Stock discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Galvanized
¾ to 3 in. steel butt welded	33%	16%	43%	28%	41.9%	26.9%
3½ to 3 in. steel lap welded	15%	+3%	39%	25%	37.9%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 10 and 5%.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	26.00*	23.50	28.50
Tin in 5-ton lots	94.00	95.00	63.75
Lead	8.05	7.90	11.00
Spelter	8.40	8.50	8.75

*Government price.

ST. LOUIS

Lead	7.75	7.72½	10.75
Spelter	8.10	8.22½	8.25

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Copper sheets, base	38.00	32.50	38.00	38.00	40.00	33.50	39.40
Copper wire (carload lots)	35.00	31.00	38.50	35.00	39.00	33.00	38.50
Brass sheets	39.75	31.75	40.00	37.00	36.00	31.50	42.00
Brass pipe	46.00	36.50	43.00	42.00	46.00	41.50	46.50
Solder (half and half) (case lots)	60.00	70.00	39.25	62.00	39.50	70.00	39.25

Note:—Solder very scarce.

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c. per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; 25% to be added to mill prices for extras; 50% to be added to warehouse price for extras:

	Current	One Year Ago
Mill	$32.25	$42.00
New York	34.25	45.50
Cleveland	35.00	38.00
Chicago	29.50	42.50

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 15.00

	In Casks Current	In Casks One Year Ago	Broken Lots Current	Broken Lots One Year Ago
Cleveland	18.75	21.00	18.40	21.50
New York	16.50	23.00	17.00	23.25
Chicago	22.00	22.50	21.50	23.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots, for spot delivery, duty paid:

	Current	One Year Ago
New York	13.25	16.00
Chicago	13.50	18.50
Cleveland	16.00	19.00

There is an apparent discrepancy at this point.

The pages are either missing or the pagination is incorrect.

The filming is recorded as the book is found in the collections.

SHOP MATERIALS AND SUPPLIES

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York Current 1918	New York One Yr. Ago	Cleveland Current 1918	Cleveland One Yr. Ago	Chicago
Copper, heavy and crucible	24.00	23.50	24.00	26.75	23.50
Copper, heavy and wire	22.50	22.50	23.50	25.75	23.25
Copper, light and bottoms	20.50	20.50	21.00	22.00	22.00
Lead, heavy	7.00	8.50	21.50	9.20	7.85
Lead, tea	5.25	6.50	7.50	6.50	6.50
Brass, heavy	14.75	15.00	6.00	17.00	23.50
Brass, light	11.00	11.00	12.50	13.50	13.00
No. 1 yellow brass turnings	13.50	15.50	14.00	15.00	13.50
Zinc	6.00	6.00	6.50	7.00	6.35

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (1-15 ton lots), per lb.	33.20c.	32.20c.	33½c.

This is the Government price for lots of from 1 to 14 tons.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	42.00	41.00
Chicago	38.00	39.00
Cleveland	36.50	41.00

BABBITT METAL—Warehouse price per pound:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Best grade	125.00	70.00	108.00	71.75	100.00	70.00
Commercial	70.00	40.00	23.00	24.50	24.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$2.50*	List	$1.20	$1.65	$1.05	$3.00
Hot pressed hexagon	2.50*	List	1.00	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.40	1.00	1.60
Cold punched hexagon	2.50*	List	.75	1.40	1.00	2.00

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅝ by 4 in. and smaller	30%	46%	37%
Larger and longer up to 1 in. by 30 in.	15%	40%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York ..... $2.50 Cleveland ..... $3.00 Chicago $2.50

For cast-iron washers the base price per 100 lb. is as follows:
New York ..... $5.00 Cleveland ..... $4.00 Chicago $3.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
⅝ by 4 in. and smaller	30%	46%	37%
Larger and longer up to 1 in. by 30 in.	15%	40%	25—5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets Current	Rivets One Year Ago	Burs Current	Burs One Year Ago
Cleveland	List plus 10%	List plus 10%	List plus 10%	List plus 10%
Chicago	List price	List price	List plus 20%	List price
New York	20% from list	10-2½% from list	List plus 20%	10-2½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ¼ and smaller	30%	45—5%	45%*
Tinned	30%	45—5%	45%*

Button heads, ⅜, ½, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.
New York..$5.65 Cleveland..$5.15 Chicago..$5.67 Pittsburgh..$4.65
Coneheads, same sizes:
New York..$5.75 Cleveland..$5.25 Chicago..$5.77 Pittsburgh..$4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	49.00	42.50	39.50
Brass	40.00	40.00	44.00

For immediate stock shipment 3c. is usually added. The prices of course vary with the quantity purchased. For lots of less than 100 lb. but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb. but not less than 50 lb., the advance is 2½c. over base (100-lb. lots); for less than 50 lb. but not less than 25 lb., 5c. should be added to the base price; and for quantities under 25 lb. the increase above base is 10c.

TIN PLATES—Warehouse prices per box:

Coke tin plate, 14 x 20:

	Cleveland Current	Cleveland One Yr. Ago	Chicago Current	Chicago One Yr. Ago
100 lb.	$10.00	$12.00	$10.60	$11.75
I. C. 107 lb.	10.15	12.17½	10.70	11.90

Terne plate, 20 x 28:

Base Weight	Net Weight	Coating				
100 lb.	200	3	18.05	18.70	19.10	17.50
I. C.	214	8	19.25	19.00	19.40	17.85
I. C.	270	8	21.75	21.50	21.40	19.95
I. C.	218	12	21.75	19.85	22.60	18.85
I. C.	221	15	22.50	20.35	22.10	19.10
I. C.	226	30	23.25	21.75	22.60	20.15
I. C.	231	25	24.50	22.20	23.10	20.90
I. C.	236	30	25.75	23.50	23.60	21.85
I. C.	241	35	26.75	24.50	25.10	22.85
I. C.	246	40	28.00	25.75	25.60	24.15

NOTE—New York prices furnished on application to dealers. Price varies according to whether the plates are wanted for work essential to the war or for nonessential work.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	12.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13¼ x 13¼	13¼ x 20½
Cleveland	52.00	58.00
Chicago	48.00	50.00

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.40	2.35	2.00
Chicago	2.00	2.00	2.25

ROLL SULPHUR in 360-lb. bbl sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$4.30	$4.30	$2.85
Cleveland	4.60	4.50	4.60
Chicago	4.00	4.00	3.25

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	Aug. 8	Aug. 1	July 25	July 17	July 10	July 3
Prompt furnace	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Chicago	450-lb. bbl.	$2.50
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Yr. Ago
Raw in barrels	$1.86	$1.16	$2.10	$1.20	$2.05	$1.17
5-gal. cans	1.96	1.26	2.25	1.35	2.25	1.27

WHITE AND RED LEAD in 500-lb. lots sells as follows in cents per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Year Ago Dry and In Oil
100-lb. keg	14.00	14.50	13.25	13.50	14.00	13.00
25 and 50-lb. kegs	14.25	14.75	13.50	13.75	14.25	13.25
12½-lb. keg	14.50	15.00	13.75	14.00	14.50	13.50
5-lb. cans	——	——	15.25	15.50	16.00	15.50
1-lb. cans	——	——	15.25	15.50	17.30	15.50

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

WASHINGTON, D. C.

The Navy aims to give information regarding its purchases to all manufacturers known to be in a position to supply its demand. Owing to the need of prompt action in the cases of all machine tools hereinafter listed, the Navy cannot arrange to permit a postponement of the opening of bids if the manufacturers are able to secure bidding forms and submit their bids prior to date fixed for opening.

In case time does not permit this, it will be appreciated if any manufacturer not receiving information directly regarding these purchases will notify the Purchasing Division, Bureau of Supplies & Accounts, Navy Department, Washington, D. C., in order that the firm's name may be properly listed for all future purchases.

The Bureau of Supplies and Accounts, Navy Department, will soon receive bids for furnishing at Navy Yard, here, the following machines and machine tools:

Schedule 1899, 3 plain, tool and cutter grinders; one 8 ft. lathe; 1 bolt thread machine; 4 vertical boring machines; 2 horizontal, boring and drilling machines; 3 vertical, sensitive boring machines; 1 corebox machine; 15 plain, double arm, universal, milling machines; 1 single spindle, shaping machine; six, 4, 8 and 12 in. slotter machines; 3 tool grinding machines; six 22 and 28 in. drill presses; twelve, 2 and 3 spindle drill presses; 3 half, universal, radial, drill presses; 3 trimming presses.

Schedule No. 1901, 10 automatic screw machines; two 48 in. by 8 or 12 ft. planers; 9 brack geared, pillar cranked shapers.

The Bureau of Supplies and Accounts, Navy Department, received bids furnishing machines and machine tools, as follows:

Schedule No. 5154½, Class 705, (Item 1)—2 motor driven, lock corner machines, delivery Navy Yard, Wash., D. C., from Luster-Jordan Co., Inc., Finance Bldg., Philadelphia, Penn., $5,567; S. A. Woods Machine Co., Damrell St., Boston, Mass., $2,187.85, part bid.

Schedule No. 4942½, Class 708, (Item 1)—One 36 in. x 20 ft., heavy duty, geared head, engine lathe, delivery Naval Ammunition Depot, Hingham, Mass., from Bridgeford Machine Tool Works, Winton Rd., N., Rochester, N. Y., $5,480; Lynd-Farquhar Co., 419 Atlantic Ave., Boston, Mass., $6,582; Manning, Maxwell and Moore, 119 West 40th St., New York City, $7,500; Niles Bement and Pond, 111 Bway, New York City, $7,995; Henry Prentiss, 149 Bway, New York City, $7,213; Swind Machine Co., Philadelphia, Penn., $7,245.

Schedule No. 5034½, Class 710, (Item 2)—1 floor type, arbor press; (Item 3)—2 bench type, arbor presses; (Item 4)—One 4 leaf type, cornice brake, delivery Navy Yard, Philadelphia, Penn., from Atlas Press Co., Kalamazoo, Mich., $271 part bid; E. Bartlett, 41 Crown St., Nashua, N. H., $50, part bid; W. F. Davis Tool Co., 945 Pennsylvania Ave., Wash., D. C., $1,165; Dreis Drump Manufacturing Co., 2911 South Halsted St., Chicago, Ill., $825; Fairbanks Co., Colorado Bldg., Wash. D. C., $271, part bid; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $1,136, alternate, $1,319; Manning, Maxwell and Moore, 119 West 40th St., New York City, $488, part bid; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., $330, part bid; Swind Machine Co., Widener Bldg., Philadelphia, Penn., $305, part bid; Vandyck Churchill Co., Bourse Bldg., Philadelphia, Penn., $800, alternate, $825, $1,186.

Schedule No. 5145½, Class 685, (Item 1)—4 patternmakers' lathes, delivery Navy Yard, Boston, Mass.; (Item 2)—6, delivery Navy Yard, Brooklyn, N. Y.; (Item 3)—2, delivery, Navy Yard, Philadelphia, Penn.; (Item 4)—2, delivery Navy Yard, Norfolk, Va.; Item 4)—2, delivery Mare Isand, Calif.; from J. A. Fay and Egan, John and Front St., Cincinnati, Ohio, $20, 176; Oliver Machine Co., 50 Church St., New York City, $17,960, alternate, $16,600; American Woodworking Machine Co., 591 Lyell Ave., Rochester, N. Y., $19,124; Newman Machine Co., Greensboro, N. C., $27,591.

Schedule No. 5146½, Class 686 (Item 1) fifty ½-in. electric drills, delivery Boston, Mass. (Item 2) 100, delivery Brooklyn, N. Y. (Item 3) 50, delivery Philadelphia, Penn. (Item 4) 100, delivery Norfolk, Va. (Item 5) 30, delivery Mare Island, Calif. (Item 6) twenty ¼ in., delivery Boston, Mass. (Item 7) 50, delivery Brooklyn, N. Y. (Item 8) 20, delivery Philadelphia, Penn. (Item 9) 8, delivery Mare Island, Calif. (Item 10) 10, delivery Norfolk, Va., from Chicago Pneumatic Tool Co., 143 South Dearborn St., Chicago, $36,312; Cincinnati Electric Tool Co., Freeman and Flint St., Cincinnati, Ohio; Dale Brewster Machine Co., 30 Church St., New York City, $32,400; The Fairbanks Co., Colorado Bldg. Wash., D. C., part bid, $23,760; the Hisey Wolf Machine Co., Colerain Ave. and Marshall St., Cincinnati, Ohio, $33,195; Manning, Maxwell and Moore, 119 West 40th St., New York City, $41,310; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., $30,822; National Electric Supply Co., 1330 New York Ave., Wash., D. C., part bid, $23,130; McNeil, Smith Electric Tool Co., Cincinnati, O., $30,900; Standard Tool and Machine Co., 237 Laurel Ave., Arlington, N. J., part bid, $23,342; U. S. Electric Tool Co., 2488 West 6th St., Cincinnati, O., part bid, $12,056; Wetmore Savage Co., 76 Pearl St., Boston, Mass., part bid, $31,768; Western Electric Co., 195 Bway., New York City, part bid, $24,780; Independent Pneumatic Tool Co., 1307 Michigan Ave., Chicago, part bid, $22,275; J. Clark, Jr., Electric Co., 520 West Main St., Louisville, Ky., $36,140.

Schedule No. 5039½, Class 494, (Item 1)—31 high duty, universal engine lathes, bed 12 in. x 5 ft., delivery United States Naval Academy, Annapolis, Md., from W. F. Davis Tool Manufacturing Co., 945 Pennsylvania Ave., Wash., D. C., $1,105, alternate, $1,198; Fairbanks Co. Colorado Bldg., Wash., D. C., $958; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $890, alternate, $1,283; Monarch Machine Co., 300 North 3rd St., Philadelphia, Penn., $1,250; Manning, Maxwell and Moore, 119 West 40th St., New York City, $776; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., $1,175, alternate, $1,120, $1,225, $1,175; Shepard Lathe Co., Canal and Jackson St., Cincinnati, Ohio, $613; Sterritt & Stoer Co. Finance Bldg., Philadelphia, Penn., $1,494; Aumen Machine Co., 107-9 East Lombard St., Baltimore, Md., $858; Master Machine Tool Co., 261 West 36th St., New York City, $874.

Schedule No. 5014½, Class 495, (Item 1)—1 power press, size No. 4, single acting, 1¼ in. open back stroke, equipped with tool and holders for punch, and die for making lead and copper gas checks for fuzes; delivery, Naval Ammunition Depot, Ft. Mifflin, Penn., from Niagara Machine and Tool Co., 683 Northland Ave., Buffalo, N. Y., $823; Swind Machine Co., Widener Bldg., Philadelphia, Penn., $380; Waterbury Farrell Foundry Co., 425 Bank St., Waterbury, Conn., $1,125.

Schedule No. 5138½, Class 675, (Item 1)—2 universal woodworking machines, delivery Boston, Mass.; (Item 2)—4, delivery Brooklyn, N. Y.; (Item 3)—2, delivery Philadelphia, Penn.; (Item 4)—2, delivery Norfolk, Va.; from Fairbanks Co., Colorado Bldg., Wash., D. C., $13,328; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $9,708, alternate, $11,308; Manning, Maxwell and Moore, 119 West 40th St., New York City $12,542; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., $11,750; E. L. Stringer, Baltimore, Md., $11,900; Sidney Machine Tool Co., Sidney, Ohio, $9,917; Vandyck Churchill Co., Bourse Bldg., Philadelphia, Penn., $13,120; Machinery Merchants, 50 Church St., New York City, $13,420; Parks Ball Bearing Machine Co., Knowlton and Fergus St., Cincinnati, Ohio, $8,000.

Schedule No. 5139½, Classes 676, 677, 678 and 679; (Item 1)—20 tinsmiths' forming, folding, wiring and turning machines, delivery Boston, Mass.; (Item 2)—50, delivery Brooklyn, N. Y.; (Item 3)—20, delivery Philadelphia, Penn.; (Item 4)—20, delivery Norfolk, Va.; (Item 5)—20, delivery Mare Island, Calif.; from Niagara Machine Tool Co., 683 Northland Ave., Buffalo, N. Y., (Class 676) $3,930, (Class 677) $17,415, (Class 678) $2,461, (Class 679) $2,253; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., (Class 676 $4,439, (Class 677) $15,010, (Class 678) $2,456, (Class 679) $2,249; Peck Stowe & Wilcox Co., 2176 West 3rd St., Cleveland, Ohio, (Class 676) $3,753, (Class 677) $16, 236, (Class 678) $2,439, (Class 679) $2,117.

Schedule No. 5140½, Class 680, (Item 1)—10 wood trimmers, delivery Boston, Mass.; (Item 2)—20, delivery, Brooklyn, N. Y.; (Item 3)—10, delivery Philadelphia, Penn.; (Item 4)—10, delivery Norfolk, Va.; (Item 5)—8, delivery Mare Island, Calif.; from Fox Machine Co., 1304 West Ganson St., Jackson, Mich., $2,900; Manning, Maxwell and Moore, 119 West 40th St., New York City, $2707; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., $3,596; Oliver Machine Co., 50 Church St., New York City, $3,728; American Woodworking Machine Co., 591 Lyell Ave., Rochester, N. Y., $3,791.

Schedule No. 5141½, Class 681, (Item 1)—20 leaver shears, delivery Boston, Mass.; (Item 2)—50, delivery Brooklyn, N. Y. (Item 3)—20, delivery Philadelphia, Penn.; (Item 4)—20, delivery Norfolk, Va.; (Item 5)—20, delivery Mare Island, Calif.; from H. T. Dakin Co., 90 West Bway, New York City, $9,046; Niagara Machine Co., 683 Northland Ave., Buffalo, N. Y., $11,324; Kemp Machine Co. 223 North Calvert St., Baltimore, Md., $6,620; Manning, Maxwell and Moore, 119 West 40th St., New York City, $9 990; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., $6,180, alternate, $5,900; Frank Toomey, 127 North 3rd St., Philadelphia, Penn., $8,951; Vandyck Churchill Co., Bourse Bldg., Philadelphia, Penn., $9,123.

Schedule No. 5142½, Class 682, (Item 1)—4 electric band saws delivery Boston, Mass.; (Item 2)—6, delivery Brooklyn, N. Y.; (Item 3)—2, delivery Philadelphia, Penn.; (Item 4)—2, delivery Norfolk, Va.; (Item 5)—2, delivery Mare Island, Calif., from Fairbanks Co., Colorado Bldg., Wash., D. C., $8,108; J. A. Fay and Egan, John and Front Sts., Cincinnati, Ohio., $7,857; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $7,032; D. Nash Machine Co., Bourse Bldg., Philadelphia, Penn., $7,460, alternate $7,340; Manning, Maxwell and Moore, 119 West 40th St., New York City, $8,374; Oliver Machine Co., 50 Church St., New York City, $10,230, alternate, $8,630; Swind Machine Co., Widener Bldg., Philadelphia, Penn., $5,636; E. Stringer, Baltimore, Md., $6,000; Sidney Machine Co., Sidney, Ohio, $4,410; Vandyck Churchill Co., Bourse Bldg., Philadelphia, Penn., $9,285; P. B. Yates Ma-

chine Co., Beloit, Wis., $8,400; American Woodworking Machine Co., 591 Lyell Ave., Rochester, N. Y., $8,189; Briggs Machine Co., 238 2nd Ave., Pittsburgh, Penn., $9,914, alternate, $9,274; Machinery Merchants Co., 50 Church St., New York City, $8,100; Newman Machine Co., Greensboro, N. C., $6,896.

Schedule No. 5149½, Class 688, (Item 1)—4, floor type, 2 H.P., 110 volt grinders, delivery Boston, Mass.; (Item 2)—6, delivery Brooklyn, N. Y.; (Item 3)—2, delivery Philadelphia, Penn.; (Item 4)—2, delivery Norfolk, Va.; (Item 5)—2, delivery Mare Island, Calif.; Class 689, (Item 1)—6, bench type, 120 volt, 1 H.P., grinders, delivery Boston, Mass.; (Item 2)—10, delivery, Brooklyn, N. Y.; (Item 3)—4, delivery Philadelphia, Penn.; (Item 4)—4, delivery Norfolk, Va.; (Item 5)—4, Mare Island, Calif.; from Cincinnati Electric Tool Co., Freeman and Flint St., Cincinnati, Ohio, (Class 688) $2,774, (Class 689) $2,589; Fairbanks Co., Colorado Bldg., Wash., D. C., (Class 688) $3,080, (Class 689) $3,474; Hisey Wolf Machine Co., Colerain Ave. and Marshall St., Cincinnati, Ohio, (Class 688) $3,392, (Class 689) $2,772; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., (Class 688) $2,791, (Class 689) $3,229; Manning, Maxwell and Moore, 119 West 40th St., New York City, (Class 688) $2,712, (Class 689) $3,066; McNeil & Smith Electric Tool Co., Cincinnati, Ohio, (Class 688) $2,760, (Class 689) $2,840; Roth Bros., 1400 West Adams St., Chicago, Ill., (Class 688) $4,050, (Class 689) $3,261; United States Electric Tool Co., 2488 West 6th St., Cincinnati, Ohio, (Class 688) $3,040, (Class 689) $3,034; J. Clark Jr. Electric Co., 520 West Main St., Louisville, Ky., (Class 688) $3,034, (Class 689) $3,116; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., (Class 689) $2,400.

Schedule No. 5168½, Class 711, (Item 1)—1 motor driven, universal, cutter and reamer grinding machine; (Item 1a)—sets of carbon brushes for motor; (Item 1b)—1 cutter grinding attachment form; delivery Philadelphia, Penn., from Browne Shard Manufacturing Co., Promenade St., Providence, R. I., $737; Cincinnati Milling Machine Co., Marburg Ave. and South St., Oakley (Cincinnati, P. O.), $661; Kemp Machine Co., 223 North Calvert St., Baltimore Md. $411; W. E. Shipley Machine Co., Finance Bldg., Philadelphia, Penn., $914; Wood Engineering Co., Alliance, Ohio, $730; Vandyck Churchill Co., Bourse Bldg., Philadelphia, Penn., $983.

Schedule No. 5086½, Class 482, (Item 1)—9 portable, gyratory sieves; (Item 2)—three 36 x 72 in., sand screens, suitable for screening molding sand; Class 484, (Item 1)—1 portable, centrifugal, sand mixing machine, suitable for mixing green and dry sand facing and core sands, using oil, flour and compounds as binder; Class 485, (Item 1)—1 thread milling machine, delivery Navy Yard, Wash., D. C., from the Federal Foundry Supply Co., 2639 East 79th St., Cleveland, Ohio, (1 and 2, Class 482)—$1215, part bid; J. W. Paxson Co., 1021 North Delaware Ave., Philadelphia, Penn., (1 and 2, Class 482)—$1296; (1-Class 484)—$850; Pratt & Whitney, 436 Capitol Ave., Hartford, Conn., (1-Class 485)—$1505.

Schedule No. 5013½, Class 497, (Item 1)—2 power presses, delivery, Navy Yard, Brooklyn, N. Y., from E. W. Bliss Co., Brooklyn, N. Y., $950, alternate, $978; Ferracute Machine Co., East Commerce St., Bridgeton, N. J., $930; Fairbanks Co., Colorado Bldg., Wash., D. C., $1175; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $938; Manning, Maxwell & Moore, Inc., 119 West 40th St., New York City, $1176; Sherritt & Stoer, Finance Bldg., Philadelphia, Penn., $1116; D. H. Stoll Co., 31 Lansing St., Buffalo, N. Y., $1400.

Schedule No. 4849½, Class 499. (Item 1)—12 speed lathes for wood turning, delivery United States Naval Academy, Annapolis, Md., from Aumen Machine Co., 107-9 East Lombard St., Baltimore, Md., $237; Oliver Machine Co., 50 Church St., New York City, $235; American Woodworking Machine Co., 347 Madison Ave., New York City, $237.

Schedule No. 5159½, Class 696, (Item 1)—800 plates; (Item 2)—2 belt driven, core making machines; (Item 3a)—25 sets of malleable iron match plates; (Item 3b)—24 hinges; (Item 3c)—24 latches; (Item 3d)—15 sets of malleable iron plates; (Item 3e)—16 hinges; (Item 3f)—16 latches; delivery Navy Yard, Philadelphia, Penn., and Brooklyn, N. Y., for foreign shop equipment, from Federal Foundry & Supply Co., 2639 East 79th St., Cleveland, Ohio, $637, part bid; S. Obermayer Co., 2563 West 18th St., Chicago, Ill., $684; Wadsworth Core Machine and Equipment Co., 10 West Buchtel Ave., Akron, Ohio, ..674, part bid.

Schedule No. 5144½, Class 684, (Item 1)—four 24 in. 110 volt direct current, drill presses, delivery Navy Yard, Boston, Mass., (Item 2)—six, 24 in. 110 volt direct current drill presses delivery, Navy Yard, Brooklyn, N. Y.; (Item 3)—two 24 in., 110 volt direct current, drill presses, delivery, Navy Yard, Philadelphia, Penn.; (Item 4) two 24 in., 110 volt direct current, drill presses, delivery Navy Yard, Norfolk, Va.; (Item 5)—two 24 in., 110 volt direct current, dril presses, delivery, Navy Yard, Mare Island, Calif., from W. F. Davis & Son, 945 Pennsylvania Ave., Wash., D. C., $10,672; Fairbanks Co., Colorado Bldg., Wash., D. C., $13,828; Hoefer Manufacturing Co., 155 Chicago St., Freeport, Ill., $14,436; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $12,280, alternate, $8786; Monarch Machine Co., 300 North 3rd St., Philadelphia, Penn., $14,598; Manning, Maxwell & Moore, Inc., 119 West 40th St., New York City, $19,56; Niles, Bement & Pond, 111 B'way, New York City, $11,250; W. E. Shipley Machine Co., Morris Bldg., Philadelphia, Penn., $2300, part bid; F. Foomey, Inc., Philadelphia, Penn., $8696 part bid; D. Nast Machine Co., Bourse Bldg., Philadelphia, Penn., $10,570.

METAL WORKING

NEW ENGLAND STATES

Conn., Hartford—H. Evarts, 15 Forest St., has awarded the contract for a 1-story, 40 x 114 ft. machine shop to be erected on Francis Ave. Estimated cost, $12,000.

Conn., New Haven—The New York, New Haven & Hartford R. R. is building a 1-story, 43 x 68 ft. machine shop at Ferry St. and Middletown Ave. E. Gayd, Ch. Engr.

Conn., Wallingford—R. Wallace & Sons have awarded the contract for the construction of a 3-story, 50 x 120 ft. factory for the manufacture of silverware. Estimated cost, $50,000.

Mass., Boston—The Walworth Manufacturing Co., 798 1st St., manufacturer of steam supplies, has awarded the contract for the erection of a 1-story, 30 x 40 ft. addition to its plant.

Mass., Fitchburg—Manning, Maxwell and Moore, Inc., 119 West 40th St., New York City, have awarded the contract for the erection of a 1-story, 200 x 220 ft. addition to their factory here.

Mass., Hudson—The La Pointe Machine Tool Co., Tonder St., has awarded the contract for the construction of a 1-story addition to its factory. Estimated cost, $10,000.

Mass., Springfield—The Hendee Manufacturing Co., 837 State St., manufacturer of motorcycles, is receiving bids for the erection of a 1-story, 60 x 81 ft. hardening room and a 40 x 71 ft. boiler house.

Mass., Westfield—The Bay State Foundry Co. has awarded the contract for the erection of a 1-story, 20 x 60 ft. addition to its plant.

R. I., Providence—The Brown & Sharpe Manufacturing Co., Promenade St., manufacturers of machines and tools, have awarded the contract for the erection of a 2-story, 65 x 175 ft. addition to their plant.

MIDDLE ATLANTIC STATES

D. C., Wash.—Bids will be received by the Commissioners of the District of Columbia, District Bldg., until Aug. 19, for furnishing and installing machine shop equipment at the New Central High School, 13th and Clifton Sts.

Md., Baltimore—The American Can Co., Maryland Trust Bldg., has awarded the contract for a 4-story, 38 x 140 x 176 ft. can factory to be erected on Boston and Hudson St. Estimated cost, $150,000. Noted July 18.

Md., Baltimore—J. T. Lewis Bros. Co., 1015-19 East Fayette St., has awarded the contract for a plant for the manufacture of ammunition to include several 1- and 2-story factory buildings of various sizes, to be erected on Columbia Ave. Noted July 18.

N. J., Camden—F. A. Zondler has had plans prepared for the construction of a 1-story machine shop at 2714 Saunder St.

N. J., Jersey City—Fire recently damaged the machine shop of the Mersereau Metal Bed Co., 292 Johnston Ave.

N. J., Newark—The Klaxon Co., 194 Wright St., manufacturer of electrical appliances, has purchased a site and plans to build a 200 x 700 ft. mill.

N. J., Newark—The Ruth Realty Co., 31 Runyon St., has awarded the contract for the erection of a 1-story, 60 x 80 ft., brick factory at 30-32 Brandford St. Estimated cost, $10,000. Lessee will be R. J. Emory Co., 30 Runyon St., machinists.

N. J., Sewaren—The Vulcan Detinning Co. is building an addition to its plant.

N. Y., Buffalo—The Ferguson Steel and Iron Co., 1399 Bailey Ave., has had plans prepared for a 1-story machine shop and a wood-working shop to be erected at its plant on Abbott Rd. Estimated cost, $30,000.

N. Y., Buffalo—The Kellogg Structural Steel Co., 31 Stone St., will build a 1-story, 20 x 24 ft. and 24 x 99 ft. shop and addition to its factory. Estimated cost, $25,000.

N. Y., Buffalo—The Pierce Arrow Motor Co., 1693 Elmwood Ave., is receiving bids for the construction of a 25 x 350 ft. testing plant. Estimated cost, $25,000.

N. Y., Buffalo—The H. G. Trout Co., 226 Ohio St., manufacturer of machinery, plans to build a 1-story addition to its plant.

N. Y., Buffalo—The United States Car Wheel Co., 15 Forest Ave., is having plans prepared for the erection of a 1-story, 58 x 158 ft., brick and steel factory. Estimated cost, $30,000.

N. Y., Buffalo—The J. H. Williams Co., Vulcan St., has awarded the contract for a 1-story, 50 x 80 ft. addition to its drop forging plant on Kemore St. Estimated cost, $15,000.

N. Y., Cortland—The Brockway Motor Truck Co. plans to build a 1-story, 50 x 200 ft. addition to its plant on Railroad Ave.

N. Y., Geneva—The Catchpole Boiler, Foundry and Machine Co., Jackson St., has had plans prepared for the construction of a 1-story, 20 x 85 ft. addition to its plant.

N. Y., Maybrook Junction—The New York, New Haven & Hartford R. R., New Haven, Conn., has awarded the contract for a roundhouse to be erected here. Estimated cost, $100,000. E. Gagel, Ch. Engr.

N. Y., New York (Borough of Brooklyn)—J. Aaron, 936 St. Mark's Ave., has had plans prepared by Denninger & Crumbley, Arch., 391 East 149th St., Bronx, for a 1-story garage to be erected on Throop Ave. south of Myrtle Ave. Estimated cost, $15,000.

N. Y., Rochester—The Taylor Instrument Co., 95 Ames St., has awarded the contract for a 3-story, 100 x 230 ft. factory.

N. Y., Solvay—Pass & Seymour, manufacturers of electrical goods, is having plans prepared for the erection of a 1- and 2-story addition to their plant.

N. Y., Tarrytown—The Chevrolet Motor Co., Broadway and 57th St., New York City, has awarded the contract for a 4-story plant to be erected here. Noted May 30.

N. Y., Tonawanda—The McKinnon Chain Co. plans to build a factory for the manufacture of chains in connection with its plant which is nearing completion. F. A. Shoemaker, Engr.

Penn., Allentown—The International Motor Co., is building an 80 x 220 ft. addition to its plant.

Penn., Allentown—The J. A. Rupp Paper Co., 25 South 8th St., plans to install new machinery including roll slitters, power cutting machinery, etc., in the proposed factory, to be erected on Hamilton St. Total cost, $50,000.

Penn., Beaver Falls—The Moltrup Steel Products Co. has purchased the former plant of the Pittsburg Radium Co. on 1st Ave. and plans to convert same into a producing plant for its own use.

Penn., Erie—The Erie Fireproof Garage is building a garage on French and 5th St. Estimated cost, $35,000.

Penn., Johnstown—The Johnstown Automobile Co. has purchased a site adjoining its plant on Main St. and plans to build an addition to same.

SOUTHERN STATES

Ala., Auburn—The Alabama Polytechnic Institute, Box 25, is in the market for dish-washing machinery for its mess hall.

Fla., Tarpon Springs—The Anclote Shipbuilding Co. has had plans prepared for the erection of a shipbuilding plant on the Anclote River. M. B. Cheesman, Engr. Noted Aug. 1.

Ky., Central City—The Illinois Central R. R., 135 East 11th Place, Chicago, Ill., is receiving bids for an engine terminal to be erected here, which will include a 1-story, 40 x 148 ft. machine shop, a roundhouse and other buildings. A. S. Baldwin, Ch. Engr. Noted Aug. 1.

Ky., Covington—Fire recently damaged the metal working plant of the Moeschl-Edwards Corrugating Co. Loss, about $8000.

Ky., Frankford—The Franklin Grain Products, Co., recently organized with $100,000 capital stock, plans to install milling machinery, drying apparatus, evaporators, etc., in its plant. About $75,000 will be expended.

Ky., Louisville—The Matt Cochran Co. is building a 30 x 125 ft. addition to its brass and copper foundry. New equipment will be installed.

Penn., McKeesport—The National Tube Co. plans to build a large mill addition to its galvanizing works.

Penn., North East—The Electric Materials Co. is building a 50 x 75 ft. addition to its plant on Washington St., which will be used as a forge room.

Penn., Philadelphia—The Atwater Kent Manufacturing Co., 4937 Stanton Ave., plans to build an addition to its factory. Proby, Seeburger & Robenold, 40 South 15th St., Arch.

Penn., Philadelphia—The E. G. Budd Manufacturing Co., 25th St. and Hunting Park Ave., manufacturer of steel automobile bodies, has awarded the contract for the construction of a 1-story, 70 x 125 ft. addition to its plant. Estimated cost, $25,000.

Penn., Philadelphia—A. H. Burton has acquired a machine shop at 1015-29 Hamilton St. and plans to operate same for the manufacture of metal products.

Penn., Philadelphia—The Dentist Supply Co., 220 North 52nd St., has awarded the contract for the alteration of and an addition to its factory at 5119 Stile St.

Penn., Philadelphia—Furness, Withy and Co., steamship owners and agents, plan to build a 1-story, 48 x 90 ft. repair shop on Cambria and Milvale St.

Penn., Philadelphia—The Haas Automobile and Supply Co., 4303 North 15th St., has awarded the contract for a 1- and 3-story addition to its plant on North Broad St. Noted July 4.

Penn., Philadelphia—The Pennsylvania Equipment Co., 1420 Chestnut St., is in the market for a 500 ton hydraulic forging press, distance between columns about 7 x 10 ft.

Penn., Philadelphia—M. Rock, 826 East Allegheny Ave., will soon start construction work on a 1-story, 28 x 150 ft. garage to be erected at 997-999 North 5th St. Estimated cost, $10,000.

Penn., Philadelphia—W. and H. Rowland, Tacony and Lewis St., manufacturers of springs, have awarded the contract for the reconstruction of a factory which was recently damaged by fire. Noted Aug. 8.

Penn., Philadelphia—The Southwark Foundry and Machine Co., 430 Washington Ave., manufacturer of traction engines, etc., is building a 1-story, 55 x 135 ft. foundry and machine shop on 4th St. Estimated cost, $45,000.

Penn., Pittsburgh—The Concrete Products Co., Diamond Bank Bldg., is in the market for a 5-15 ton traveling crane, 25-60 ft. span, 2 phase, 60 cycle.

Penn., Reading—The Carpenter Steel Co. is building several additions to its plant, including a 2-story, 20 x 60 ft. shop. The company also has had plans prepared for a 1-story, 35 x 55 ft. addition to be erected on River Rd. Estimated cost, $23,000.

Penn., Reading—The Schuykill Navigation Co. is building a 1-story, 60 x 100 ft. sawmill and lumber working plant.

Penn., Williamsport—The Williamsport Wire Rope Co., foot of Campbell St., has awarded the contract for the construction of a 1-story, 90 x 200 ft. addition to its plant. Estimated cost, $40,000.

Ky., Louisville—The Vendome Copper and Brass Works, 721 East Main St., is enlarging its plant. New equipment will be installed in same.

Ky., Paducah—Fire recently damaged the shipbuilding plant of the Howard Shipyards Co. Loss, $100,000.

N. C., Charlotte—The Cole Manufacturing Co., Lawyers Rd., manufacturer of farm implements, has awarded the contract for the construction of a 30 x 60 ft. addition to its pattern building and a 20 x 90 ft. addition to its woodworking shop. Estimated cost, $7250.

N. C., Goldsboro—The Carolina Airplane Co., Raleigh, plans to build a factory here. H. L. Atwood, Pres.

N. C., Greensboro—The Cade Manufacturing Co., manufacturer of typesetting machines, has purchased a plant and plans to remodel and install the necessary equipment in same for its own use. E. B. Hamrick, Shelby, Pres.

S. C., Columbia—The P. T. Parker Co., 700 College St., manufacturer of press cloth, plans to install machinery with electric power belt drive, in the proposed 80 x 100 ft. addition to its mill. Estimated cost, including machinery, $33,000. Noted May 2.

Tenn., Chattanooga—The Chattanooga Car and Foundry Co. has been acquired by the Lucey Manufacturing Co., 19th and Grove St., who will convert same into a plant for the manufacture of well drilling machinery.

Va., Denbigh—J. W. Hoopes is in the market for either steam or gasoline power laundry equipment.

Va., Lynchburg—D. B. Ryland, Bus. Mgr., Chamber of Commerce, is in the market for machinery with which to equip a plant for the manufacture of excelsior.

Va., Norfolk—The Berkley Machine Works, foot of Mulberry St., has increased its capital stock from $75,000 to $120,000 and plans to build additions to its plant.

Va., Richmond—The Newport News Shipbuilding and Dry Dock Co., Newport News, has awarded the contract for the erection of a boiler factory here. Plant includes a 160 x 600 ft. foundry, machine and boiler shop and various other units. Estimated cost, $4,000,000.

MIDDLE WEST STATES

Ill., Alton—The Western Cartridge Co. is in the market for a considerable quantity of extremely intricate special automatic machinery which will have to be built to specification. The company is executing contracts for small arms ammunition running into millions of dollars.

Ill., Chicago—The American Can Co., 103 South Michigan Ave., is in the market for three No. 73½ Bliss presses.

Ill., Chicago—The Chicago Bridge and Iron Works, 1311 West 105th St., has awarded the contract for a 2-story, 48 x 54 ft. addition to its temper shop, at 1325-27 West 105th St. Estimated cost, $10,000.

Ill., Chicago—The Iroquois Iron Co., 3267 East 95th St., has had plans prepared by C. D. Rawstorne, Arch., 122 South Michigan Ave., for the erection of a 1-story, 56 x 66 ft. machine shop. Estimated cost, $17,000.

Ill., Chicago—The Lincoln Brass and Spinning Co. has awarded the contract for a 2-story, 25 x 125 ft. addition to its factory at 3262 Grand Ave. G. J. Henery, Mgr.

Ill., Chicago—The Manufacturers' Equipment Co., 175 North Jefferson St., manufacturer of machinery and tools, has awarded the contract for a 1-story, 60 x 280 ft. factory to be erected on Fillmore and 57th Ave.

Ill., Chicago—The Railway and Mine Supply Co., 332 South Michigan Ave., is in the market for a No. 5 Bulldozer.

Ill., Chicago—Sharp & Smith, 155 North Michigan Ave., is in the market for a 1500 lb. drop hammer.

Ill., Chicago—The Tempelton Kenly Co., manufacturer of railway jacks, has awarded the contract for a 1-story factory to be erected at 1020 South Central Ave. Estimated cost, $30,000.

Ill., Chicago—The Western Electric Co., Hawthorne St., is in the market for a number of No. 00 and No. 1 arbor presses.

Ill., Cicero—The Midland Structural Steel Co., North Hoyne Ave., Chicago, is building a 26 x 26 ft. and 75 x 85 ft. plant here.

Ill., East Dubuque—The Schwind Foundry and Machine Co., 527 Bank & Insurance Bldg., Dubuque, Iowa, recently incorporated with $75,000 capital stock, plans to establish its factory here. W. V. Toeppel, Secy.

Ill., La Salle—The Matthiessen, Hegeler Zinc Co. has awarded the contract for the construction of a 1- and 2-story, 131 x 261 ft. shop and warehouse. Estimated cost, $80,000.

Ind., Anderson—The Remy Electric Co. of the United Motors Corporation, is building a 50 x 320 ft. factory addition to its plant, which will extend on Columbus Ave. Noted July 18.

Ind. Gary—The American Tin Plate Co. is building a 24 mill addition to its tinplate plant in Calumet Twp., here. Estimated cost, $10,000,000. Noted July 25.

Ind., Huntington—The Orton Steinbrenner Co., manufacturer of material handling machinery, is building a 1-story, 23 x 77 ft. and 46 x 60 ft. addition to its factory on East Washington St. Estimated cost, $3500.

Ind., Indiana Harbor—The American Steel Foundries Co. is in the market for a Williams or Vandervoort type cutting-off machine to handle 9.2 in. and 9.5 in. shell forgings.

Ind., Indianapolis—The Fairbanks Morse Electric Manufacturing Co., 21st and Northwestern Ave., is building a 2-story addition to its plant. Estimated cost, $75,000. Noted Apr. 25.

Ind., Indianapolis—The Ideal Brass Works, North Elder St., is receiving bids for the erection of a 1-story factory. Estimated cost, $25,000.

Ind., Indianapolis—The Pennsylvania Lines, West of Pittsburgh, Southwest System, Pennsylvania Station, Pittsburgh, has awarded the contract for a 1-story, 35 x 75 ft. addition to its machine shop here. W. C. Cushing, Ch. Engr.

Ind., Peru—The Lake Erie & Western R.R., Noble and Washington Sts., Indianapolis, has awarded the contract for a 1-story roundhouse, to be erected here. J. K. Conner, Ch. Engr. Noted July 18.

Mich., Detroit—The Central Forge Co. has awarded the contract for a forge and foundry plant to be erected on Euclid Ave. and the Detroit, Grand Haven & Milwaukee R. R.

Mich., Detroit—The Flower-Stephens Manufacturing Co., Clayton and Parkinson St., plans to build a 1-story, 135 x 225 ft. foundry. Esselstyn, Murphy & Hanford, New Telegraph Bldg., Engr. and Arch.

Mich., Detroit—The W. J. Hartwig Co., manufacturer of electrical supplies, has awarded the contract for a 3-story factory to be erected on West Jefferson Ave. and 15th St.

Mich., Detroit—The Michigan Steel Castings Co., 248 Guoin St., has awarded the contract for a 3-story, 90 x 120 ft. factory and foundry. Estimated cost, $65,000.

Mich., Detroit—The Motors Metal Manufacturing Co. has awarded the contract for the construction of a factory on Milford Pl. Noted Aug. 1.

Mich., Detroit—The Paige-Detroit Motor Car Co., McKinstry and Fort St., has awarded the contract for the erection of a 3-story addition to its factory.

Ohio, Akron—The Whitman Barnes Co., 114 East Buchtel St., manufacturer of machine supplies, lawn mowers, haying tools, implements, etc., has awarded the contract for the construction of a 1-story, 40 x 120 ft. factory. Estimated cost, $15,000.

Ohio, Barberton—The Ohio Insulator Co. is building a 1-story, 40 x 60 ft. top addition to its factory. Estimated cost, $6000. C. H. Meachman, Mgr.

Ohio, Cincinnati—The American Valve & Meter Co., 2833 Spring Grove Ave., will be in the market for several shapers, 3 or 4 lathes, 2 or 3 grinders, 1 pipe lathe, 4 boring mills, and other equipment for use in the new addition which is being built to its plant.

Ohio, Cincinnati—The Herchede Hall Clock Co. plans to build an addition to its plant on Reading Rd. Estimated cost, $25,000.

Ohio, Cincinnati—The Peters Cartridge Co., First National Bank Bldg., is in the market for a large amount of equipment for use in the former Le Blond machine-tool plant, which is to be used for the production of munitions.

Ohio, Cleveland—The Chicago Pneumatic Tool Co. has awarded the contract for a 3-story, 56 x 293 ft. addition to its plant at East 49th St. and Lakeside Ave. Estimated cost, $150,000.

Ohio, Cleveland—The International Steel Tie Co., 16102 Waterloo Rd., will build a 1-story, 50 x 220 ft. factory. Estimated cost, $30,000. V. C. Oswald, Pres. Noted July 11.

Ohio, Cleveland—The Lake and Ocean Shipbuilding Co. has had plans prepared for the erection of a 31 x 14 ft. shop on East 40th St. and the lake.

Ohio, Cleveland—The National Acme Co. has awarded the contract for a 1-story, 120 x 170 ft. garage to be erected at 209 East 131st St. Estimated cost, $30,000.

Ohio, Coalburg—The New York Central R.R., 1324 West 3rd St., Cleveland, Ohio, has awarded the contract for several 1-story railroad shops to be erected here. Estimated cost, $500,000. G. C. Cleveland, Ch. Engr.

Ohio, Conneaut—The Conneaut Shovel Co., Whitney Rd., is building a 25 x 150 ft. machine shop addition to its plant. Noted May 2.

Ohio, Dayton—The Kinderman Steel and Machinery Co., Muskegon, Mich., has purchased a site on Xenia Ave., and will at once start construction work on a plant for the manufacture of gun sights.

Ohio, Dennison—The Pennsylvania Lines West of Pittsburgh, Pennsylvania Sta., Pittsburgh, plans to build an addition to its machine shop here. W. C. Cushing, Pittsburgh, Ch. Engr.

Ohio, Lima—The Lake Erie & Western R.R., Washington and Noble Sts., Indianapolis, Ind., has awarded the contract for a roundhouse, to be erected here. J. K. Conner, Ch. Engr.

Ohio, Lima—The Lima Locomotive Works, South Main St., will soon start construction work on an addition to its plant. Estimated cost, $4,000,000.

Ohio, McConnellsville—D. Van Fossen is having plans prepared by A. A. Hanson, Arch., Zanesville, for the construction of a 2-story, 66 x 150 ft. garage. Estimated cost, $10,000.

Ohio, Oakley (Cincinnati P. O.)—The Alvey Ferguson Co., North Ave., has awarded the contract for the construction of a 1-story, 50 x 100 ft. addition to its metal working plant. Estimated cost, $10,000. Noted Aug. 1.

Ohio, Piqua—The Wood Shovel and Tool Co. has awarded the contract for the construction of a 1-story, 54 x 85 ft. addition to its factory. Estimated cost, $15,000. Noted May 16.

Ohio, Toledo—The Doehler Die Castings Co., manufacturer of hand grenades, depth bombs, and parts of gas masks, plans to build a 1-story, 100 ft. addition to its foundry and a 2-story, 50 x 150 ft. factory on Smead Ave. and the Lake Shore R. R.

Ohio, Toledo—The Wehrle Co. is in the market for a 24-36 in. planer.

Wis., Kenosha—The Winther Motor Truck Co., Winthrop Harbor, Ill., has awarded the contract for the erection of a 150 x 350 ft. plant. Estimated cost, $150,000. M. P. Winther, Pres. and Gen. Mgr. Noted July 4.

Wis., Racine—The Hamilton Beach Manufacturing Co., Rapids Drive, manufacturer of small electric motors, motor driven devices, etc., has awarded the contract for the erection of a 3-story, 80 x 150 ft., factory and warehouse addition to its plant. Estimated cost, $50,000.

WEST OF MISSISSIPPI

Iowa, Sarroll—The Perfection Corn Planter Manufacturing Co. is building a 1-story, 60 x 150 ft. factory.

Min., Ada—The Union Motor Car Co. will at once start construction work on a 2-story 50 x 50 garage. Estimated cost, $10,000.

Mo., Clinton—The Standard Semi-Steel Foundry Co., Harrisonville, has purchased a 75 x 200 ft. factory here and plans to remodel same into foundry and install the necessary equipment.

Mo., Joplin—The Badger Mining Co. has awarded the contract for a 80 x 90 ft. concentrating plant to be erected 12 miles from here. Estimated cost, $56,000. L. P. Jones, Pres. and Mgr.

Mo., St. Charles—The American Car and Foundry Co., Syndicate Trust Bldg., St. Louis, will soon award the contract for a 2-story, 95 x 241 ft. machine and pattern shop to be erected on Main and Lewis St., here. Estimated cost, including equipment, $250,000. Brussel & Viterho, Wright Bldg., St. Louis, Arch.

Mo., St. Louis—The Johnson Tin Foil and Metal Co., 6020 South B'way, has awarded the contract for the construction of a 2-story, 80 x 107 ft. factory. Estimated cost, $30,000. Noted June 20.

Mo., St. Louis—The Laclede Gas Light Co., 11th and Olive St., plans to build a plant for the manufacture of explosive shells.

Mo., St. Louis—W. H. Matthews & Bros., 3722 Forest Park Bldg., manufacturer of electrical supplies, has awarded the contract for the construction of a 1-story, 35 x 38, ft. factory. Estimated cost, $5000.

Mo., Springfield—The Chevrolet Motor Co., 416 St. Louis St., has awarded the contract for the construction of a 1-story, 70 x 140 ft. public garage. Estimated cost, $12,000.

Neb., Omaha—D. G. Kellog, c/o N. R. Brigham, Arch., 1119-23 City National Bank Bldg., is receiving bids for a 1-story, 103 x 128 ft. garage to be erected on 24th St. and Camden Ave. Estimated cost, $15,000.

Okla., Oklahoma—W. P. Materson, 301 West 12th St., is in the market for equipment for a cotton mill for manufacturing duck or goods of finer quality.

Tex., Ft. Worth—G. V. Morton plans to build a garage on Commerce St., Block 505. Estimated cost, $18,000.

WESTERN STATES

Calif., San Francisco—The Pacific Shipbuilding Co. is in the market for a horizontal boring mill for boring 72 in. cylinders, or a 10-ft. vertical boring machine. Immediate delivery.

Ore., Portland—Fire recently damaged a portion of the foundry belonging to J. M. Leach, 377 Flint St. Loss, about $500.

Ore., Portland—The Pacific Car and Foundry Co., Portland, is making extensive improvements to its plant here.

Utah, Salt Lake City—The Utah Junk Co., 840 South 4th St., W., is in the market for a 10-ton crane with 76-ft. span.

Wash., Seattle—The Franklin Tool Works, 10 West Connecticut St., is in the market for a considerable amount of equipment for use in its plant, including a 15-ton traveling crane, span about 40 ft., standard mark; 3 or 4 Acme or Ajax model, forging machines; also a 7000 or 8000 lb., Bennett or Morgan model, double-frame steamhammer.

Wash., Seattle—The Mars Metal Co., 1049 Railroad Ave., has awarded the contract for the construction of a 1-story, 90 x 120 ft. foundry. Estimated cost, $8000.

Wash., Seattle—The Vulcan Manufacturing Co., 1200 4th St., S., has awarded the contract for the erection of additions to its plant. Estimated cost, $15,000. Noted July 11.

Ont., Elora—The T. E. Bissell Co., Ltd., is in the market for a Beaudry upright trip hammer, belt driven, No. 4 or 5.

Ont., London—The Dennis Wire and Iron Works, 22-26 Dundas St., is in the market for 10-ft. sheet metal brake and sheet metal power driven squaring shears to cut up to ¼-in. metal, 8-10 ft. long.

GENERAL MANUFACTURING

NEW ENGLAND STATES

Me., Bangor—A. B. Haskell Co., Brewer, is having plans prepared by F. A. Patterson, Arch., 16 Central St., for a 2-story, 35 x 95 ft. factory to be erected here, for the manufacture of caskets.

Mass., Peabody—The Pierce Leather Corporation, Wallis St., has awarded the contract for the construction of a 3-story, 13 x 90 ft. addition to its factory. Estimated cost, $10,000.

R. I., Woonsocket—The Enterprise Dye Works, 229 1st Ave., has awarded the contract for the construction of a 2-story, 72 x 88 ft. plant.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Baltimore & Ohio R.R., Baltimore & Ohio Bldg., has awarded the contract for the construction of a 1-story icing plant. Estimated cost, $25,000. H. A. Lane, Ch. Engr.

Md., Emmitsburg—The Union Manufacturing Co., Frederick, manufacturer of hosiery, has awarded the contract for a 1-story, 20 x 70 ft. factory to be erected here.

Md., Hutton—The Tioga Tanning Co. has awarded the contract for the construction of an addition to its tannery. Estimated cost, $18,000.

N. J., Bloomfield—Fries & Bro., 92 Reade St., New York City, manufacturers of chemicals, have had plans prepared for a factory to be erected on Orange and Hill Sts., here. Estimated cost, $20,000.

N. J., Bridgeton—The Cumberland Glass Manufacturing Co. has had plans prepared for the construction of a 1-story addition to its plant on North Laurel St. Estimated cost, $10,000.

N. J., Newark—The Dye Products and Chemical Co., 187 Poinier Ave., plans to build a factory on Vanderpool Ave.

N. Y., Binghamton—The Larrabee Deyo Motor Truck Co., 28 Washington St., has awarded the contract for the construction of a 2-story, 48 x 100 ft. paint shop. Estimated cost, $50,000.

N. Y., Buffalo—The Air Reduction Sales Co., 584 Carroll St., has awarded the contract for the erection of a 1-story, 50 x 150 ft., rein.-con., steel and brick factory on Grant St., near New York Central R.R. tracks. Estimated cost, $25,000. Noted Aug. 8.

N. Y., Buffalo—The Board of Supervisors, Erie County, plans to rebuild the laundry building on Macy St., here, which was recently destroyed by fire. Estimated cost, $15,000. L. Britting, Williamsville, in charge.

N. Y., New York (Borough of Brooklyn)—The Pines Rubber Co., 148 39th St., manufacturer of raincoats, is receiving bids for the erection of a 3-story, 50 x 280 ft., brick factory on 37th St., between Fort Hamilton and 13th Ave. Total cost, $100,000. E. M. Adelsohn, 1776 Pitkin Ave., Arch.

N. Y., New York (Borough of Manhattan)—Fire recently destroyed the rope and twine manufacturing plant of G. W. Millar & Co., 284 Lafayette St. Loss, about $200,000.

N. Y., New York (Borough of Queens)—The Ravenswood Paper Mills Co. has had plans prepared for a 1-story, 70 x 95 ft. addition to its plant in Long Island City. Estimated cost, $10,000.

N. Y., Niagara Falls—The Niagara Electric Chemical Co. will soon award the contract for a 2-story, 25 x 324 ft. factory to be erected on Buffalo Ave. Estimated cost, $50,000. R. C. Fayfield, Iroquois Bldg., Buffalo, Arch.

N. Y., Pyrities—The De Grassi Paper Co. is building a factory here. E. E. Whitney, Engr.

N. Y., Split Rock (Syracuse P. O.)—The Semet-Solvay Co., Milton Rd., Syracuse, is receiving bids for a 1- and 2-story, 40 x 80 ft. and 60 x 120 ft. TNT plant to be erected here. Estimated cost, $50,000. H. N. Cole, c/o owner, Arch.

N. Y., West Point—The West Point Military Academy has awarded the contract for the construction of a laundry.

Penn., Mt. Union—Aetna Explosive Co., Inc., 120 Bway, New York City, is rebuilding its factory here, including 25 buildings, which was recently destroyed by fire. Estimated cost, $200,000. Noted July 11.

Penn., Philadelphia—R. McNeely, 1732 North Randolph St., manufacturer of glazed kid, has awarded the contract for the construction of a 3-story, 8 x 13 ft. addition to its factory. Estimated cost, $5000.

Penn., Philadelphia—The Unit Construction Co., 131 South 31st St., manufacturer of auto tops, has awarded thecontract for the construction of a 1-story, 80 x 81 ft. addition to its factory. Estimated cost, $20,000.

SOUTHERN STATES

Ala., Boyles (Birmingham P. O.)—The Birmingham Coke and Byproducts Co., recently incorporated, has had plans prepared for the construction of a coke oven plant for the manufacture of ammonia solvent, naphtha and other chemicals. Estimated cost, $3,000,000. M. W. Bush, American Trust Bldg., Pres.

Fla., La Belle—J. H. Hicks plans to install a rice mill of 5000 lbs. capacity.

Ky., Louisville—The Emery Box Co. has increased its capital stock from $200,000 to $250,000, and plans to make improvements to its plant.

N. C., Charlotte—The A. Collins Lumber Co. has acquired a site and plans to build a 50 x 100 ft. planing mill. Estimated cost, including machinery, $25,000.

N. C., Hickory—The Hickory Spinning Co. plans to build an addition to its mills and equip same with 10,000 spindles. Estimated cost, including equipment, $250,000.

N. C., Thomasville—The Ragan Knitting Co., manufacturer of hosiery, plans to install 50 knitting machines, with electric power drive for the equipment of its 3-story, 40 x 120 ft. factory. Estimated cost, $25,000.

N. C., Wilmington—The West Coast Shipbuilding Co., Portland, Ore., has purchased the shipyard of the Naull Shipbuilding Co., here, and plans to install the necessary equipment for the construction of concrete barges. H. E. Spear, Pres.

S. C., Georgetown—S. J. Flaum, I. McG. Carraway and T. W. Barnfield plan to build a cotton gin.

Tenn., Asbury—The Knoxville Sand and Transportation Co., Bank & Trust Bldg., Knoxville, plans to rebuild its lime plant here, which was recently destroyed by fire with a loss of $6000.

Va., Norfolk—Banks Bros., Chapel St., plan to rebuild a meat packing plant which was recently destroyed with a loss of $175,000.

Va., Winchester—The National Fruit Products Co. will soon receive bids for the construction of a 1- and 2-story, 75 x 204 ft. cannery. Estimated cost, $30,000. C. Dawson, in charge. Noted Mar. 14.

W. Va., Wheeling—The Wheeling Pulverizing Co., recently incorporated, has awarded the contract for the erection of a pulverizing plant. S. J. Windsor, Pres.

MIDDLE WEST

Ill., Chicago—The Cross, Press & Sign Co., Dayton and Black Hawk St., will soon award the contract for the construction of a 1- and 2-story, 75 x 75 ft. tannery. Estimated cost, $15,000. C. E. Fraxier, 30 North Dearborn St., Arch. Noted May 23.

Ill., Chicago—The Flett Paper Stock Co., is having plans prepared by A. Foster, Arch., 9254 Winchester Ave., for a 3-story, 85 x 100 ft. factory and warehouse, to be erected on West 48th St. and Maplewood Ave. Estimated cost, $600,000. J. Flett, Pres.

Ill., Chicago—The Maremont Manufacturing Co., 910 South Wabash Ave., manufacturer of wagons, has awarded the contract for the erection of a 1-story, 60 x 160 ft. factory. Estimated cost, $24,000.

Ill., Chicago—The Star Cereal Co., 2132 West Chicago Ave., is having plans prepared by A. L. Himbelblau, Arch., 179 West Washington St., for a 2-story factory to be erected on Western Ave. and Kinzie St. Estimated cost, $25,000.

Ill., Waukegan—The Griess-Pfleger Tanning Co. is building a 140 x 170 ft. new hide house unit at its plant. Noted July 4.

Ind., Bedford—The Reliance Manufacturing Co., 512 South Wells St., Chicago, will soon award the contract for a 2-story, 72 x 173 ft. factory to be erected here for the manufacture of shirts. Estimated cost, $45,000. A. S. Aischuler, 28 East Jackson Blvd., Chicago, Arch.

Ind., Indianapolis.—The Prestolite Co., 510 North Capitol Ave., manufacturer of gas tanks, will build a 1-story, 100 x 400 ft. factory at Speedway City. Estimated cost, $100,000. A. B. Floyd, c/o owner, Eng.

Ind., Kokomo—The Kokomo Rubber Co. is building a 2-story plant on South Main St. Estimated cost, $25,000.

Ind., Marion—Fire recently destroyed the plant of the T. H. Bedell Manufacturing Co., manufacturer of tables. Loss, $80,000.

Ind., Marion—The Indiana Truck Co., has awarded the contract for a 50 x 250 ft. addition to its factory on Sanitare Ave. Noted July 25.

Ind., Michigan City—F. H. Burnham & Co., Ohio and Wall St., manufacturer of gloves and mittens, will soon receive bids for the construction of a 3-story, 30 x 30 ft. and 50 x 90 ft. addition to its factory. J. C. Llewellyn, 28 South Dearborn St., Chicago, Ill., Arch.

Ind., Winchester—The Hoosier Auto Co., will build a 1-story, 50 x 105 ft. addition to its garage. Estimated cost, $12,000.

Ohio, Cincinnati—The Van Agthoven Sons Co., manufacturer of slack barrels, has awarded the contract for the construction of an addition to its plant on West Front St.

Ohio, Cleveland—The Aluminum Castings Co., 6205 Carnegie Ave., has awarded the contract for a 1-story, 140 x 260 ft. factory to be erected at 2800 Harvard Ave. Estimated cost, $80,000. Noted Aug. 8.

Ohio, Cleveland—The Buckeye Brass and Manufacturing Co., 1809 Columbus Rd., has awarded the contract for the construction of a machine shop and a foundry. Estimated cost, $30,000. H. Selker, Pres. Noted July 18.

Ohio, Cleveland—The Phoenix Oil Co., 2554 West 5th St., has purchased a site on Mary Ave. and will at once start construction work on a factory. Estimated cost, $60,000.

Ohio, Cleveland—The K. W. Ignition Co., 2813 Chester Ave., will soon start construction work on its 1-story, 62 x 139 ft. factory to be erected on Chester and 27th St. Estimated cost, $18,000. J. A. Williams, Pres. and Mgr.

Ohio, Dayton—E. Hostetter, 220 Delaware Ave., is having plans prepared by Thies & Thies, Arch., Davies Bldg., for the construction of a 1-story, 30 x 120 ft. evaporating plant. Estimated cost, $30,000.

Ohio, London—The London Grave Vault Co. is rebuilding its plant which was recently damaged by fire.

Ohio, Lorain—The Cleveland Macadam Co., 1040 Leader-News Bldg., Cleveland, has had plans prepared for a shipyard to be erected on the Black River, here, for the construction of concrete vessels. Estimated cost, $500,000.

Ohio, Newark—The Independent Packing Co., recently incorporated with $150,000 capital stock, has taken over the former plant of the Newark Provision Co. and is renovating same for its own use. The company also plans to establish a creamery in connection with the plant. C. M. Andrews, formerly of the Newark Provision Co., C. S. McKinney, C. J. Stradley and others, incorporators.

Ohio, Warren—The Gregory Rubber Co., 144 North Union Ave., Akron, will soon start construction work on its plant here, the main unit of which will be a 2-story, 50 x 100 ft. factory. Stalker & Hemp, 706 Western Reserve Bank Bldg., local representatives. Noted Aug. 8.

Wis., Augusta—Russell's Corners Creamery Co. has awarded the contract for the construction of a creamery. Estimated cost, $12,000.

Wis., Burlington—The Electropure Dairy Co., 53 Jackson Blvd., Chicago, Ill., plans to build a 2-story milk plant here. Estimated cost, $30,000.

Wis., Cuba—The National Zinc Ore Separating Co. plans to build an acid plant here. C. Barker, Supt.

Wis., Elroy—The Elroy Farmers' Coöperative Dairy Co. plans to build a 42 x 90 ft. creamery. W. Healy, Secy.

Wis., Glidden—The Northern Wood Products, manufacturer of tool handles, broom sticks, etc., plans to rebuild its factory and power plant recently damaged by fire. Estimated cost, $35,000. W. A. Thomas, Gen. Mgr.

Wis., Janesville—The State Board of Control, Madison, has awarded the contract for remodelling the laundry at the Wisconsin School for the Blind, here. J. O. Davidson, Pres.

Wis., Jefferson—The Waverly Manufacturing Co., manufacturer of motors, has acquired a building here and plans to remodel same into a factory for its own use. Address, A. B. Haberman.

Wis., La Crosse—The Wisconsin Pearl Button Co. is building a 66 x 73 ft. and a 1-story, 60 x 110 ft. factory.

Wis., Milwaukee—Elkhert Bros., 1118 26th St., is receiving bids for a 3-story, 47 x 64 ft. tannery to be erected on 8th St. Estimated cost, $50,000.

Wis., Milwaukee—The Milwaukee Shoe Co., 816 11th St., has awarded the contract for the construction of a 4-story, 40 x 45 ft. addition to its factory.

Wis., Neenah—The Jerslid Knitting Co. has awarded the contract for the construction of a 3-story, 65 x 120 ft. addition to its factory. Estimated cost, $35,000.

Wis., Stoughton—The Wisconsin Dairy Products Co. plans to build a 2-story, 80 x 142 ft. addition to its condensory.

Wis., Waukesha—The Henk Mineral Spring Co., 406 West Ave., has had plans prepared by W. G. Herbst, Arch., Caswell Bldg., Milwaukee, for the construction of a 1-story, 55 x 250 ft. addition to its water bottling works. Estimated cost, $65,000.

Wis., Waukesha—The Thompson Malted Food Co. plans to build an addition to its plant. H. C. Hengels, 1st National Bank Bldg., Milwaukee, Arch.

Wiss., West Allis — The North End Foundry Co., 60th Ave., is having plans prepared by Klug & Smith, Engr., Mack Bldg., Milwaukee, for the construction of a 1-story, 60 x 80 ft. addition to its foundry.

WEST OF THE MISSISSIPPI

Ark., Arkadelphia—J. B. Blake has purchased the lumber and stave mills of the Arkadelphia Milling Co. and plans to improve and enlarge same.

Ark., Glenwood—P. Burke plans to build a cotton gin.

Ark., Marmaduke—The Vail Cooperage Co., Ft. Wayne, Ind., plans to rebuild its plant for the manufacture of staves, which was recently damaged by fire.

Ark., Newport—R. Harmon plans to establish a sawmill near here.

Ark., Quinn—The Barringer Lumber Co. plans to rebuild its planing mill which was recently destroyed by fire.

Ark., Walnut Hill—J. Bleich, Fulton, plans to establish a sawmill near here.

Iowa, Cedar Rapids—The J. G. Cherry Co., manufacturer of creamery supplies, egg cases, etc., plans to build an addition to its factory on 10th Ave. and 4th St. E. W. Cherry, Pres.

Kan., Wichita—St. Francis Hospital, 9th and Emporia St., has awarded the contract for the construction of a 2-story, 49 x 68 ft. laundry and power house. Estimated cost, $20,000.

Mo., St. Louis—The American Paper Products Co., 2nd St. and Bremen Ave., has awarded the contract for remodeling its factory. Estimated cost, $3000.

Mo., St. Louis—The Henderson & Willis Welding and Cutting Co., 305 North 11th St., has awarded the contract for the construction of a 2-story, 30 x 50 ft. factory. Noted Mar. 7.

Mo., St. Louis—The Mallinckrodt Chemical Co., 3600 North Second St., will soon receive bids for a 60 x 400 ft. ether factory to be erected on Second and Mallinckrodt St. Estimated cost, $25,000. A. H. Haeseler, Wainwright Bldg., Arch.

Mont., Billings—Swift & Co., Union Stock Yards, Chicago, Ill., has awarded the contract for a 2-story, 60 x 75 ft. packing plant to be erected here. Estimated cost, $40,000.

Neb., Lincoln—The Gooch Food Products Co. is having plans prepared by P. H. Anthony, Arch., 1109 Waldheim Bldg., Kansas City, Mo., for the construction of a 2-story addition to its factory.

Neb., Omaha—The Omaha Packing Co. plans to build a 2-story, 40 x 60 ft. packing plant on Burlington and 38th St.

Neb., South Omaha (Omaha P. O.)—The Skinner Packing Co., 14th St. and Jackson Ave., is building a packing plant. P. Skinner, Pres. Noted Mar. 28.

Tex., Port Arthur—Adams & Eddington Shipbuilding Corporation, recently incorporated with $60,000 capital stock, has acquired a site on Taylor's Bayou, here, and plans to build a plant for the construction of concrete vessels.

WESTERN STATES

Ore., Gold Hill—The State of Oregon is building a 200-ton capacity limestone fertilizer plant near here, and plans to equip same with a 5500 ft. aerial tramway.

Ore., Sams Valley—L. H. Blomquist is rebuilding his sawmill near here and equipping it with a large capacity box factory.

Wash., Seattle—W. M. Cowley, Northlake, and Latona Ave., plans to build a 2-story, 72 x 127 ft. boat factory. Estimated cost, $8000. J. Schlack, Lippy Bldg., Arch.

CANADA

N. B., Van Buren—The Allendale Lumber Co. plans to rebuild its mill which was recently destroyed by fire with a loss of $150,000. A. E. Hammond, Proprietor.

Ont., Toronto—The Consumers' Gasoline Supply Co., plans to build a 1-story gasoline service station on College and Lippincott St. Estimated cost, $10,250.

Ont., Toronto—The Corrugated Paper Box Co., Ltd., 187 Geary Ave., plans to build an addition to its factory. Estimated cost, $10,000.